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REPORT RESUMES

ED 002 795 24
A STUDY OF THE RELATIVE EFFECTIVENESS OF DIFFERENT APPROACHES OF SPEECH TRAINING FOR MENTALLY RETARDED CHILDREN.
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SAN FRANCISCO STATE COLL., CALIF.
REPORT NUMBER CRP-165 PUB DATE 60
CONTRACT OEC-SAE-5904
EDRS PRICE MF-$0.27 HC-$7.56 189P.

DESCRIPTORS- SENSORY EXPERIENCES, *MENTAL RETARDATION, *CHILD DEVELOPMENT, SPEECH INSTRUCTION, EDUCATIONAL EXPERIMENTS, *SPEECH IMPROVEMENT, *COMMUNICATION (THOUGHT TRANSFER), EVALUATION TECHNIQUES, LANGUAGE ENRICHMENT, ACHIEVEMENT TESTS, COGNITIVE TESTS, DIAGNOSTIC TESTS (EDUCATION), SAN FRANCISCO INVENTORY OF COMMUNICATIVE EFFECTIVENESS (SFICE), SAN FRANCISCO, CALIFORNIA

SPEECH IMPROVEMENT TECHNIQUES FOR MENTAL RETARDATES WERE EXAMINED USING COMMUNICATION-CENTERED SPEECH THERAPY TO ENHANCE ARTICULATION AND GENERAL ORAL PRODUCTION AND TO IMPROVE SUCH RELATIONSHIP ATTRIBUTES AS COMMUNICATIVE INITIATIVE AND EASE IN SOCIAL SITUATIONS. A BATTERY OF TEST DEVICES WAS DEVELOPED, INCLUDING THE SAN FRANCISCO INVENTORY OF COMMUNICATIVE EFFECTIVENESS (SFICE) WHICH USES A COMMUNICATIVE ATTRIBUTES RATING SCALE AND A VERBAL OUTPUT SCALE, AN ARTICULATION PROFILE, AND A SOUND DISCRIMINATION TEST. TWO TYPES OF SPEECH TRAINING WERE USED IN THE STUDY--CONVENTIONAL THERAPY AND COMMUNICATION-CENTERED THERAPY. TESTS WERE ADMINISTERED TO EXPERIMENTAL SUBJECTS PRIOR TO AND AFTER THERAPY AND TO CONTROL SUBJECTS WHO RECEIVED NO THERAPY. CLINICAL EXPERIENCE GAINED DURING THE PROGRAM INDICATED THE EFFECTIVENESS OF COMMUNICATION-CENTERED SPEECH THERAPY, USING APPROACHES DUPLICATING REAL-LIFE EXPERIENCES RATHER THAN A DRILL-TYPE INSTRUCTIONAL APPROACH. HOWEVER, SINCE THIS STUDY WAS NOT DESIGNED TO SPECIFY AND TEST INDIVIDUAL PRINCIPLES AND TECHNIQUES OF COMMUNICATION-CENTERED SPEECH THERAPY, FURTHER STUDY OF THIS APPROACH IS RECOMMENDED IN WHICH ITS SPECIFIC FEATURES WILL BE MORE THOROUGHLY APPRAISED. (JH)

ED002795

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A Study of the Relative Effectiveness of Different Approaches of Speech Training for Mentally Retarded Children

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1960

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The research reported herein was performed pursuant to a contract (No. SAE-6904) with the United States Office of Education, Department of Health, Education and Welfare.

3414A

ACKNOWLEDGMENTS

The research staff expresses its appreciation to the following agencies, advisory and consulting specialists, to the California county and local school districts and children from these schools without whose help this research project could not have been completed.

The staff of the United States Office of Education; the administration and faculty of San Francisco State College; the California State Department of Education.

The research advisory committee:

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Katharine Sutter, Director, Physically Handicapped, San Francisco Unified School District

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The Sonoma (California) State Hospital, and the Cedars School (a private school for mentally retarded children at Ross, California, who provided children and facilities for pilot testing and therapy study.

The following county and local school districts who participated in the study by furnishing testing and therapy facilities and children from their special day classes for the mentally retarded.

Berkeley City
Contra Costa County
Jefferson Elementary
Laguna Salada
Marin County
Sacramento City
San Francisco City
San Mateo County
South San Francisco City

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OVERVIEW AND SUMMARY OF THE STUDY

Need for Study

In recent years, speech therapy has concerned itself with speech difficulties as problems of communication, not just problems in speech production. Speech therapists have been concerned, especially in their work with the mentally retarded, with the improvement of language as well as articulation. And the goal of speech therapy has broadened to include improvement not only in the tools of communication, but in communicative relationships as well.

Consistent with these broadened goals of speech therapy, such new therapy techniques have been employed as practice of articulation in useful communicative responses, speech practice in meaningful activities, and practice of speaking relationships with other children as well as with the therapist.

At San Francisco State College a number of these new techniques, together with conventional techniques, have been explored and combined in an eclectic therapy approach which is probably representative of the approaches currently employed by many speech therapists throughout the United States. Because of its emphasis on communicative aspects of speech and speech therapy, this particular approach has been called Communication-Centered Speech Therapy, a further discussion of which is contained in Part Three of this report.

The effectiveness of communication-centered speech therapy has been demonstrated clinically with children, including the mentally retarded, who present various types of speech problems. To support or refute this clinical impression of the effectiveness of communication-centered speech therapy with mentally retarded children, it was considered desirable to obtain experimental evidence of its effectiveness through research investigation. Two other factors also recommended such a research study: (1) the apparent pessimism among those working the the field of mental retardation as to the usefulness of speech training for the mentally retarded and, (2) the fact that the results of most previous studies of speech training of mentally retarded children, even though encouraging, are difficult to interpret because of limitations in research design and evaluating instruments used.

Purposes

Hypotheses of the present investigation were as follows:

1. The speech of mentally retarded children can be improved through speech training.
2. Speech proficiency of mentally retarded children can be more effectively improved with an approach based on duplication of real-life experiences (communication-centered speech therapy) than with a drill-type (conventional speech therapy) approach to speech training.
3. The degree of speech improvement of the educable mentally retarded is greater than that of the severely mentally retarded as a result of the two major types of speech training used in the investigation.

Essential to the testing of the above hypotheses was a set of instruments to evaluate objectively changes in communicative effectiveness. Available tests were found to be inadequate for this purpose. It therefore became necessary to develop a battery of instruments which would measure relatively small increments of change over a broad spectrum of communicative attributes, thus yielding a realistic and useful index of the mentally retarded child's communicative effectiveness.

The experimental design of the present study provided that the effectiveness of communication-centered speech therapy be compared with the effectiveness of conventional speech therapy and that the speech improvement resulting from both approaches be compared with the speech improvement made by a control group of mentally retarded children who received no speech therapy. The study further provided that results of therapy be evaluated with test instruments designed to measure a broad range of communicative attributes, including articulatory proficiency.

The study was conducted for a period of two years, nine and one-half months during which (1) the test battery was developed, (2) therapy was administered to experimental groups of mentally retarded children in the public schools, and (3) speech improvement of experimental groups was compared with that shown by control groups of mentally retarded public school children who received no therapy.

Test Battery

The test battery consisted of three tests: (I) the San Francisco Inventory of Communicative Effectiveness (SFICE) employing a Communicative Attributes Rating Sclae and a Verbal Output Scale, (II) the Articulation Profile, and (III) the Sound Discrimination Test.

I. San Francisco Inventory of Communicative Effectiveness (SFICE)

This test provided a standard test situation designed to elicit a representative sample of oral communicative behavior of mentally retarded children. Responses to this test were tape recorded and objectively analyzed through the use of the communicative attributes rating scale and verbal output scale.

Communicative Attributes Rating Scale

Tape recordings of the test performances of all subjects were rated independently by three judges in terms of a variety of attributes of communicative behavior. The attributes which appear in this inventory were determined by the present investigators to be significant components of communicative effectiveness after an extended period of observation and analysis of communicative behavior of mentally retarded children. These attributes were either not identified or were insufficiently defined in the literature or available tests.

Tapes were edited and test recordings arranged in random order so that judges would not know which were pre-therapy and which were post-therapy, or which were experimental or control. The judges were also not familiar with the children of the study.

Ratings were made on 8-point scales for each of the eleven attributes of the communicative attributes rating scale listed on page 5. Agreement among the three judges on the various sub-scales was relatively high, median intercorrelations ranging from .61 to .89 with the median of this range at .75. It should also be pointed out that on the sub-scale "Over-all Communicative Effectiveness" (an attribute individually rated, not a mathematical summation or composite of scores from other sub-scales) the median intercorrelation was .89.

Verbal Output Scale

For analysis by the verbal output scale, nine standard responses from the tape recordings were transcribed and an actual count and classification made of words and grammatical elements of these responses in terms of:

A. Sentence complexity

B. Grammatical complexity

C. Length of response (words per response)

No question of reliability was involved in this objective scoring procedure.

COMMUNICATIVE ATTRIBUTES*

RATED ON COMMUNICATIVE ATTRIBUTES RATING SCALE

1. Immediacy	Communicative initiative	Quality of communicative relationships
2. Frequency		
3. Enthusiasm		
4. Involvement		
5. Ease of social relationships		
6. Understandability	Intelligibility	Quality of communicative behavior
7. Articulation		
8. Length of response		
9. Appropriateness		
10. Complexity of ideation		
*11. Over-all communicative effectiveness		Over-all rating of communicative relationships and behavior

---

*The Communicative Attributes Rating Scale, utilizing the above attributes, and the Verbal Output Scale constitute the San Francisco Inventory of Communicative Effectiveness. The attributes in this inventory were determined by the present investigators to be significant components of communicative effectiveness after an extended period of observation and analysis of communicative behavior of mentally retarded children. These attributes were either not identified or were insufficiently defined in the literature or available tests.

**This attribute is individually rated. It is not a mathematical summation or composite of scores from the ten other sub-scales.

II. Articulation Profile

This measure of articulatory proficiency of sounds in words and syllables employed test pictures of 66 items whose names included 24 consonant sounds in each of three positions: initial, medial, final. After the manner of "stimulability" testing explored by Milisen (24) the articulation profile consisted of three sub-scales: (1) picture naming, i.e., producing the test sound in a word without imitation of the examiner, (2) word imitation, i.e., producing the test sound in a word in imitation of the examiner, and (3) sound imitation, i.e., producing the test sound in isolation in imitation of the examiner. The subject's response to each item was scored on a 6-point scale.

For various reasons it was necessary that the four speech therapists of the research staff also serve as examiners and judges of the articulation profile. Since the results of this test, therefore, depended upon individual examiner's judgments, a test of judge consistency and agreement was made comparing a sample of each judge's live ratings with ratings made by the three other judges of tape recordings of the same sample. Agreement was unusually high. All intercorrelations were .90 or better, providing assurance of the reliability of the articulation profile ratings.

III. Sound Discrimination Test

This test was designed to measure auditory discrimination of 85 pairs of rhyming test words spoken by the examiner. One word of each pair contained the test sound, the other word was phonetically the same except for the test sound. The test consisted of a short form containing 18 items representing the 12 most difficult speech sounds for mentally retarded children and a long form containing 67 items representing all consonantal categories except [3]. The short form was administered to all subjects. Only those items from the long form were administered to a subject which contained the sounds he misarticulated in the pre-therapy articulation test. No test of consistency was considered necessary in this right-wrong scoring procedure.

The test battery was given to all subjects by four examiners who also served as speech therapists in the study. Pre-therapy testing was done before subjects had been assigned to a specific experimental group, although the examiners did know which were to be experimental and which were to be control subjects. Post-therapy testing was done by three of the original four examiners, each testing children other than his own experimental group.

Subjects

Ninety subjects participated throughout the experimental period of the study. Among the various criteria for selection were I.Q. range 40 to 79, chronological age 8 to 15, current enrollment in public school classes for mentally retarded children and presence of articulatory speech problems.

Thirty-eight of these children who received no speech therapy constituted a control group C. Twenty-six children who received conventional speech therapy constituted experimental group E_1. Thirty children who received communication-centered speech therapy constituted experimental group E_2. Groups were relatively well matched in terms of intelligence, mental age, chronological age and sex.

Therapy

Following the initial tests, therapy was conducted with the two experimental groups by the four therapists, two employing conventional speech therapy and two communication-centered speech therapy. The four therapists were adequately trained and experienced in the field of speech and hearing habilitation and had had previous experience with mentally retarded children. Training and orientation of the therapists in the two therapy approaches covered a period of several months beyond their previous professional preparation.

The two experimental groups were further broken down to sub-groups of from 2 to 5 children who received therapy in groups, 30 minutes a day, four days a week for fifteen weeks. The geographical location of the schools and the number of subjects in these schools who met the criteria for inclusion in the sample determined the number of groups that could be given therapy each school day, and consequently, the number of subjects in the experimental groups.

Following the four-month therapy period, the test battery was again administered to all subjects.

Analysis of Test Data

The major statistical method used in analyzing the test results was analysis of covariance. This method was used both to correct final means for any initial differences in communicative effectiveness among the experimental and control groups and to provide for analysis of possible small changes resulting from therapy.

Covariance analysis of pre- and post-therapy ratings was made between (1) the conventional and communication-centered speech therapy subjects, (2) the conventional therapy subjects and the control subjects, (3) the communication-centered therapy subjects and the control subjects, and (4) the educable mentally retarded subjects in the two experimental groups vs. the severely mentally retarded subjects in the two experimental groups. This same pattern of analysis was carried out for each of the communicative attributes measured in the study. Differences in the degree of speech improvement were considered significant when significance levels were 5% or better.

Results

In general, results of the articulation profile support the hypotheses of the study, whereas results of the San Francisco Inventory of Communicative Effectiveness and the sound discrimination test do not.

The first hypothesis was: the speech of mentally retarded children can be improved through speech training. With respect to articulation, results indicate that communication-centered speech therapy produced significant improvement in the mentally retarded subjects of the study, although conventional therapy did not. Grammatical complexity was the only other test attribute which showed significant improvement. Conventional therapy subjects showed significant differences in improvement in grammatical complexity over the control group; communication-centered therapy subjects showed improvement approaching significance.

The second hypothesis was: speech proficiency of mentally retarded children can be more effectively improved with an approach based on duplication of real-life experiences (communication-centered speech therapy) than with a drill-type (conventional speech therapy) approach to speech training. Differences in improvement in articulation were significantly greater for the communication-centered therapy subjects than for the conventional therapy subjects. Differences in improvement made by the two experimental groups were not significant in other communicative attributes.

The third hypothesis was: the degree of speech improvement of the educable mentally retarded is greater than that of the severely mentally retarded as a result of the two major types of speech training used in the investigation. Significant differences between these two groups were not found on any of the test attributes although differences in articulation improvement, in favor of the educable mentally retarded, approached significance.

Usefulness of Test Battery

A major requirement of the study was the development of a test battery to measure a wide range of attributes of communicative effectiveness of mentally retarded children. Such a battery was developed and employed in the study and evidence obtained as to its usefulness.

Of the three tests developed in this study, the San Francisco Inventory of Communicative Effectiveness and the Articulation Profile are perceived as a useful contribution to those fields in which there is concern for assessing and improving oral communicative effectiveness. The Sound Discrimination Test, at least as developed for the purposes of this study, did not prove to be an adequate instrument for measuring sound discrimination ability of mentally retarded children.

The usefulness of the San Francisco Inventory of Communicative Effectiveness is indicated by the following factors: (1) the classification of attributes of communicative effectiveness which constitutes the framework for SFICE was derived by the present investigators from extensive analysis of communicative behavior in mentally retarded children and study of existing speech and language tests; (2) it was further demonstrated in this study that this classification lends itself to objective assessment in standard test situations; (3) there was high agreement and consistency shown among ratings by the judges; (4) although significant differences were not found between experimental and control groups on most of the SFICE sub-scores, improvement of both groups was measured on most of the scales of this test. This suggests that where improvement made by experimental groups was not statistically significant it is probably due to the shortness of the therapy period rather than to lack of sensitivity of the test itself.

Usefulness of the Articulation Profile is indicated by the following: (1) it did measure significant differences in articulation improvement; (2) it is highly objective; (3) there was high agreement among the judges; (4) test items were selected which had high recognizability among mentally retarded children and which readily elicited appropriate naming responses.

Discussion

Test Results

Two major features of communication-centered speech therapy, which are also two distinct goals of this therapy approach, are (1) improvement in speech production, including articulation, and (2) improvement in such attributes as communicative initiative, ease in social situations, ideation, etc., which contribute to effective communicative relationships. That communication-centered speech therapy successfully achieves these goals has been demonstrated repeatedly in clinic and school programs where it has been employed.

Results of the present study corroborate the clinical impression that communication-centered speech therapy improves articulation more effectively than a conventional therapy approach and that both types of therapy over a four-month period improve the oral grammatical complexity of language of mentally retarded children. However, these experimental results do not support the clinical evidence that communication-centered speech therapy is effective in improving other attributes of communication. A probable reason for this is the shortness of the therapy period in the study. It is likely that four months is too short a period of therapy to bring about measurable changes in such personality related attributes as communicative initiative, ease in social situations, etc.

Implications for Speech Therapists and Classroom Teachers*

Results of this study, with respect to improvement in articulation, (1) demonstrate that speech therapy with mentally retarded children is justified, (2) tend to support the practice followed by many speech therapists of emphasizing improvement in communicative relationships, group interaction, and the practice of speech sounds in the communicative context, and (3) with respect to teaching methods, support the educational philosophy that learning for the mentally retarded is more readily achieved through participation in real-life activities, and, concomitantly, that classroom instruction in speech and language is more successful when integrated with daily life activities of the children.

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*A detailed discussion of these implications appears in the conclusion of Part Five.

PART ONE

BACKGROUND AND NEED FOR THIS STUDY

There are three major factors which recommend conducting the present experimental investigation:

1. The increasing use of techniques in contemporary speech therapy which emphasize communicative aspects of speech problems and of speech training make it desirable to demonstrate experimentally the effectiveness of these techniques, particularly with mentally retarded children.

2. The prevalence of existing opinions that speech training for the mentally retarded is of questionable value.

3. The limitations in some of the previous studies of speech training of mentally retarded children which restrict inferences which can be made from their results.

The following discussion and review of literature indicate the need for the present study which these factors imply.

Conventional Speech Therapy

Speech therapy was for many years characterized by three distinctive features:

1. The major specific goal of conventional speech therapy was the improvement of speech sound production, especially improvement of articulation.

2. The major cause of most speech problems was apparently assumed to be the child's inability to imitate correct speech because of difficulty in discriminating correct from incorrect speech sounds. This general inference may be made from the traditional definition of

such common causes of speech problems as lack of auditory stimulation, poor speech models, foreign language background, etc. Most of these causes are explained as imitative problems for which training in auditory discrimination is the initial step in improvement.

3. Consistent with 1 and 2 above, conventional speech therapy employed an imitative learning context in which sounds were repeated in drill fashion in isolation, isolated words, and longer responses designed to give maximum repetition of the test sound.

In keeping with these three features of conventional speech therapy, speech evaluation has been traditionally limited to the assessment of correctness of speech sound production, and most conventional speech tests are designed accordingly.

Contemporary Speech Therapy

In recent years in the field of speech habilitation attention has turned to broader aspects of speech. The goal of speech therapy has been broadened to include improvement, not only of articulatory proficiency, but also skill in other communicative behavior (3,5,14,18,22). Concern has been shown for the improvement of language in speech therapy as well as articulation, especially with the mentally retarded (32,33,34,35,36). Practice in speech responses which contribute to effectiveness in communicative relationships has been tried and found useful, and speech therapy has been designed to increase success in communicative interaction and to improve the adjustive behavior of the child as an important aspect of his communicative effectiveness.

There has been increased interest in treating the underlying causes of speech problems, the major assumption being that the inability to imitate correct speech is often dependent upon underlying motivation to retain immature speech, and that this motivation may derive from unrewarding and unproductive communicative relationships (18). This explanation of major causes of speech problems recommends a broader concept of speech problems as communicative disorders with various implications for therapy, among which is the establishment of certain essential learning conditions in therapy in terms of communication: (1) the motivation to communicate, (2) a communicative learning context, (3) the use of communicative responses as speech practice material, and (4) the provision of reward for communication through the demonstration of power of the communicative response.

In the speech and hearing training program at San Francisco State College a variety of speech therapy principles and techniques have been explored over the past ten years. As a result of this experimentation, a system of speech therapy has been defined which combines various conventional and contemporary procedures of speech therapy, group therapy and education in an eclectic approach which emphasizes:

1. A broad goal of speech therapy, namely, to improve the client's communicative effectiveness through improvement of his communicative relationships, his adjustive behavior and his speech production including articulation.

2. Definition of underlying causes of many speech problems as problems of communicative relationships out of which motivations to retain the speech defect derive.

3. Treatment of underlying causes and establishment of essential learning conditions consistent with a communication-centered theory of speech learning.

Because the essential features and theoretical framework of this experimental speech therapy approach are defined in terms chiefly of communication, it has been designated as Communication-Centered Speech Therapy (18). The approach has been employed in clinic and school programs of speech therapy in which its effectiveness with children who present many different types of speech problems has been clinically demonstrated. Of particular significance is its apparent effectiveness in improving articulation, oral language, and other important attributes of the communicative behavior of severely mentally retarded children.

A major reason for conducting the present study was to obtain experimental evidence to support or refute the clinical impression of the effectiveness of communication-centered speech therapy with the mentally retarded.

Present Attitudes Toward Speech Training of Mentally Retarded

Also recommending the present investigation was the apparent doubt as to the usefulness of speech training for the mentally retarded. As Matthews indicates, "Many speech therapists provide no time for the retarded child. Such an exclusion of the retarded child from speech therapy grows out of pessimism on the part of many speech pathologists concerning the feasibility of speech correction for the mentally retarded". (20)* Among the factors which may have contributed to this opinion are the following:

1. A priori statements or conclusions made in speech literature and textbooks, or informally by speech authorities and educators, as to the lack of efficacy of speech training for mentally retarded children;
2. Assumptions or conclusions based on the results of brief or non-intensive speech therapy with mentally retarded children.

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*The reader is also referred to the Purdue University Study which presents additional information relevant to this question.

(The customary practice of the itinerant speech therapist of giving speech therapy to mentally normal children once or twice a week for periods of 20 to 30 minutes may not be adequate for the mentally retarded);

3. Doubt as to the efficacy of speech training as a result of employing speech therapy methods not adequately suited to the mentally retarded;
4. The tendency to infer or measure improvement in communicative effectiveness chiefly in terms of improvement in articulatory skills, probably because of lack of adequate instruments for measuring some of the broader aspects of communicative effectiveness.

Limitations of Previous Studies

A third reason for conducting the present study is that various factors limit the inferences which can be made from previous studies of speech training of the mentally retarded. It may be seen from the following review of recent research investigation that:

1. Control populations were inadequate or were not used in most studies.
2. In most studies, the comparative effectiveness of different techniques in speech therapy was not tested.
3. In some studies, speech therapy emphasized drill in speech production rather than speech learning in communicative contexts. In some others, the type of speech therapy used was not clearly defined.
4. Speech and language measurements were chiefly limited to tests of articulatory proficiency, or where other attributes

of communication were measured the tests did not assess a broad range of communicative skills.

Related Research

Research Related to Therapy and Assessment

Lubman (19) reported the following after several months of predominantly individual speech therapy, fifteen minutes per week, with 85 mentally retarded children ranging in IQ from 19 to 50: (1) sixty-two children showed progress according to test results and reports from classroom teachers and parents, (2) subjects between 17 and 21 years of age did not learn as rapidly as subjects aged 6 through 16 years, (3) mongoloid subjects showed more rapid and permanent improvement than did brain-damaged subjects. Speech therapy apparently proceeded from part to whole, from sound to nonsense syllable to application in functional vocabulary. Improvement was reported in articulation and in use of longer sentences and new words. Improvement was not measured against the comparative improvement of a control group who received no speech therapy.

Mecham (23) reported significant improvement for 21 mentally retarded children, IQ 41 to 75, on scales of articulatory skill auditory discrimination, auditory memory span, and mean sentence length. Individual and group therapy was given over a period of eight weeks by two therapists in three therapy sessions per week. Specific therapy techniques were left to the therapist's discretion. Routine procedures (apparently part to whole) in speech therapy were employed.

Speech improvement was evaluated in terms of articulation, sound discrimination, auditory digit memory span and oral language development. The oral language test consisted of responses to pictures which were

analyzed according to (1) average sentence length, (2) type-token ratio, and (3) frequency of grammatical parts of speech. Improvement of the experimental group (21 children) was compared with improvement made by a control group of 10 mentally retarded children.

Schlanger (32) studied the effects of speech therapy over a period of one school year with 62 special class public school mentally retarded children, ranging in IQ from 39 to 77. He concluded that emphasis placed on the individual rather than on the speech problem could produce significant gains in speech and language. Gains in articulatory proficiency and verbal output were statistically significant. Improvement was also made in social adequacy, which was evaluated in terms of subjective impression rather than controlled observation.

Measurements were made of articulation, sound discrimination and verbal output. Verbal output sentences were analyzed for the following: (1) mean sentence length, (2) percent of complete sentences, and (3) number of words per minute. A control group was not used in this study.

Schlanger and Gottsleben (33), in describing the speech program at the Vineland Training School, reported discernible gains in communicative behavior in the majority of mentally retarded children who were selected for intensified speech therapy.

A battery of tests was used to evaluate articulation, sound discrimination and auditory memory span. Observations were made of language development, chiefly in terms of vocal comprehension and output, vocabulary, and language forms. During the administration of the test battery communicative behavior was subjectively evaluated as to responsiveness, spontaneity, curiosity, degree of eye contact and speech content. Control group comparisons were not reported in this study.

Schneider and Vallon (35) having worked intensively (two to three hours per week on an individual basis) with twenty mentally retarded children, report the following:

> In view of the fact that our program of intensive speech therapy has been in effect for only six months, it would be premature at this time to offer any conclusive findings for publication. However, the progress that has been achieved to date gives cause for optimism in the role that speech therapy can plày in the training of the retarded child.

Therapy was designed to develop language as a purposeful means of communication, correct disturbances of articulation and phonation, and improve disorders of speech perception. Articulation therapy followed the traditional part-to-whole approach.

Apparently assessment was made of several attributes of speech and language including articulatory and vocal disturbances, pre-speech and pre-language concepts, abstracting and ideational thinking and imitative ability. The tests administered, as reported by these investigators, were Stanford-Binet, Kuhlman Test of Mental Development, and the Vineland Social Maturity Scale. Improvement of subjects who received therapy was not compared with improvement of a control group.

The Purdue University research reported by Rigrodsky, Hanley and Steer(30), investigated two types of articulation therapy techniques with and experimental group of 48 institutionalized mentally retarded children, ages 6 to 17 years, whose I.Q. range was 12 to 79. Two therapists worked individually with 24 subjects each, 15 minutes a day for 40 days. They used the conventional stimulus approach (part-to-whole) and the experimental approach based on Mowrer's autism theory of speech development (25,26,27). The authors concluded that while statistical interpretation of the data did not justify broad inferences concerning the efficacy of speech therapy, clinical observations indicated more success with the experimental technique than with the conventional therapeutic technique.

Four articulation tests were used in which improvement of eight consonant sounds in various positions was measured. The test materials consisted of a selected series of pictures, objects, and auditory stimuli (nonsense syllables). In addition an evaluation was made of the clarity of each subject's spontaneous speech. A group of 38 mentally retarded children who received no speech therapy was used as a control group with which to compare the experimental groups with respect to speech improvement.

Research Related to Assessment

The research cited above, in addition to describing speech training of the mentally retarded, describes a number of ways in which speech and language may be assessed. Two classic studies of the language of children of normal intelligence are referred to below to give further indication of ways in which language assessment has been made.

McCarthy (21) in her study of the language development of preschool children of normal intelligence, assessed the following language attributes of 140 children age 1-1/2 to 4-1/2 years: (1) length of response, (2) sentence construction (construction analysis), (3) parts of speech (word analysis), (4) total number of words and number of different words used (word analysis), (5) functional analysis, including egocentric responses, emotionally toned responses, dramatic imitation, social phrases, adapted information, criticism, questions, and answers.

Templin (38) studied language skills of 480 normal children age 3 to 8 years. The four areas of linguistic skill considered were (1) the articulation of speech sounds, (2) sound discrimination ability, (3) complexity of verbalizations in terms of length of response, sentence complexity, parts of speech, grammatical structure, and (4) recognition vocabulary and number of different words used (use-vocabulary).

Results of these two studies are expressed in terms of normative data on various language skills of children of normal intelligence.

Rationale for the Use of Communication-Centered Speech Therapy in This Study

A possible limitation of several of the previous studies and one of the possible reasons for pessimism among educators and speech therapists as to the efficacy of speech training is the failure to apply to mentally retarded children, speech therapy procedures which are consistent with current learning theory and more recent understanding of the learning needs of such children.

The traditional speech (articulation) therapy approach is designed chiefly to achieve correct sound production through part-to-whole exercises in an essentially individual type therapy (10,41). This approach is not consistent with the current belief that mentally retarded children learn more effectively when learning is associated with meaningful contexts of daily life activities (9,12,16).

Communication-centered speech therapy, on the other hand, provides therapy in group relationships in which communicative initiative is encouraged and speech responses useful in daily speaking activities are practiced. A whole-part-whole practice sequence is employed along with other learning principles which apparently are as applicable in speech therapy for mentally retarded children as for children of normal intelligence. These features appear to be highly consistent with present knowledge of learning needs and teaching techniques of the mentally retarded. In addition, the results of communication-centered speech therapy in clinic and school programs, particularly with mentally retarded and brain injured children, have been especially encouraging. For these reasons it was considered appropriate to use *communication-centered speech therapy* as the experimental approach to compare with conventional speech therapy in a study of speech training of the mentally retarded.*

Rationale for the Development of the San Francisco Inventory of Communicative Effectiveness (SFICE)

Another limitation in studies of the effectiveness of speech therapy and a possible reason for doubt as to the efficacy of speech training of the mentally retarded is that the measurements of speech improvement used do not assess a broad enough range of communicative skills. This tendency is understandable since the major focus of speech therapy has usually been the improvement of articulation, and since articulation is one of the speech attributes which lends itself most readily to objective evaluation. However, if the goal of speech therapy is the improvement of oral communicative effectiveness — as it is in a communication-centered approach, and as it is often defined in conventional and other speech therapy approaches (2,6,29,41) — a more complete assessment of communicative ability is appropriate in measuring speech therapy results.

In some of the previous research related to the assessment of language and speech therapy for mentally retarded children and in some programs of speech training for the mentally retarded, other aspects of communication besides articulation have been emphasized. In Table 1, page 24, it can be seen that McCarthy and Templin, in their language studies of young normal children, defined and measured such attributes of communicative behavior as length of response, sentence or grammatical construction, parts of speech, use-vocabulary, recognition-vocabulary,

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*A further comparison of the essential features of conventional and communication-centered speech therapy is contained in Part Three.

Table 7

ATTRIBUTES OF CHILDREN'S COMMUNICATIVE BEHAVIOR ANALYZED
AND/OR NOTED BY VARIOUS INVESTIGATORS

	Studies of Children with Normal IQs		Studies of Mentally Retarded Children					
	McCarthy	Templin	Lubman	Mecham	Schlanger	Schlanger & Gottsleben	Schneider & Vallon	Lassers & Low
Speech sound discrimination		X		X	X	X		X
Auditory memory span				X		X		
Verbal comprehension						X	X	
Voice						X	X	
Articulation		X	X	X	X	X	X	X
Intelligibility						X		X
Vocabulary						X	X	
Recognition		X						
Use	X	X						
Verbal output						X		X
Parts of speech	X	X	X					
Grammatical complexity		X						X
Type-token ratio				X				
Frequency					X			X
Length of response	X	X	X	X	X			X
Sentence complexity	X	X			X		X	X
Types of sentences		X						
Communicative initiative								X
Immediacy of response								X
Enthusiasm for communicative interaction								X
Involvement in communicative interaction								X
Ease in social situations								X
Appropriateness of speech content								X
Complexity of ideation								X
Overall communicative effectiveness								X
Pre-language concepts							X	
Imitative ability							X	
Initiation of language responses							X	
Responsiveness						X		
Spontaneity						X		
Curiosity						X		
Eye contact						X		
Speech content						X		
Egocentric responses	X							
Emotionally toned responses	X							
Dramatic imitation	X							
Social phrases	X							
Adapted information	X							
Criticisms	X							
Questions	X							
Answers	X							
Chronological age of children studied	18-54mo.	3-8yrs	6-21yrs	9-18yrs	Mean 12yrs		5-22yrs	7-15yrs
Intelligence quotient of children studied	Mean: 103-112	74-172	19-50	41-75	39-77		24-57	40-79

articulation and sound discrimination. In the studies of speech training of the mentally retarded reviewed above, most of these same attributes were evaluated by one investigator or another along with such other attributes as percentage of complete sentences, type-token ratio, words per minute, auditory memory span, speech content, responsiveness, spontaneity, curiosity, and degree of eye-contact.

The assessment of such attributes indicates the concern among some investigators for the development and measurement not only of articulatory proficiency, but also of other important aspects of communication. A similar concept of speech proficiency emphasizing the broader aspects of the communication gestalt was applied in the present study, both in one of the therapy approaches tested -- communication-centered speech therapy -- and in the test instruments used.

Examination of existing speech and language tests, revealed that no uniform battery of tests was available which would assess as broad a range of attributes of communicative behavior as was desired in the present study. Also, those tests which were designed to assess certain language abilities were not amenable enough to standardization of procedure and scoring to achieve sufficient objectivity of evaluation. Even existing articulation and sound discrimination tests were found inappropriate because their familiarity or recognition level was too high for mentally retarded subjects. It was therefore necessary in the present study to design a battery of new tests.

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PART TWO

STATEMENT OF HYPOTHESES

The major hypotheses of this study were as follows:

1. **The speech of mentally retarded children can be improved through speech training.**

   Do children with articulatory deviations who are in special day classes for the mentally retarded show significant improvement in communicative effectiveness as a result of specialized speech training?

2. **Speech proficiency of mentally retarded children can be more effectively improved with an approach based on duplication of real-life experiences (communication-centered speech therapy) than with a drill-type (conventional speech therapy) approach of speech training.**

   Do children with articulatory deviations who are in special day classes for the mentally retarded show greater improvement in communicative effectiveness when given communication-centered speech therapy than do comparable children in special day classes who are given conventional speech therapy?

3. **The degree of speech improvement of the educable mentally retarded is greater than that of the severely mentally retarded* as a result of the two major types of speech training used in the investigation.**

***For definition of these two groups see Appendix A.**

> Is there a relationship between the level of intellectual functioning in the mentally retarded child and (1) the amount of speech improvement which results from speech training and (2) the amount of speech improvement which results from each type of speech training?

Directly related to the primary purpose of testing therapy techniques and essential to its pursuance was the need for instruments to evaluate objectively the relative effectiveness of these two approaches in the speech training of mentally retarded children. An equally essential purpose of this study was, therefore, the development of a battery of evaluative instruments which would measure relatively small increments of change in various attributes of communication to yield a realistic and useful index of the mentally retarded child's communicative effectiveness*. Such a test battery was considered desirable on the assumption that even minimal improvement in relatively brief periods of therapy may suggest effectiveness of speech training and recommend longer and more intensive therapy.

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*It is likely that the test battery developed in this study can be used to evaluate the communicative effectiveness of children of normal intelligence as well.

PART THREE

EXPERIMENTAL DESIGN AND PROCEDURE

The present investigation was conducted for a period of two years, nine and one-half months. The first phase (March 15, 1957 to October 31, 1958) consisted of the development of a battery of tests for the measurement of the communicative effectiveness of mentally retarded children, selection of subjects, and other preparations for phase two. The second phase (November 1, 1958 to December 31, 1959) consisted of (1) administering the tests to mentally retarded experimental and control subjects, (2) conducting therapy with experimental groups (January 7 to April 30, 1959), (3) retests of all subjects, and (4) analysis and interpretation of the data.

Development of Test Battery

The test battery used in the present study consisted of several tests designed to evaluate a broad range of communicative attributes. Major parts of the test designed for this study were:

1. San Francisco Inventory of Communicative Effectiveness (SFICE)
    a. Communicative Attributes Rating Scale
    b. Verbal Output Scale
2. Articulation Profile
3. Sound Discrimination Test

Steps in Development of Tests

Construction of the tests proceeded in the following steps:

1. Review of the literature. Previous research in speech and language assessment of children, discussed in Part One of this report, indicated the need for the present test battery.

2. Examination of available tests. A variety of tests or measuring procedures have been described in the literature. An extensive and relatively standardized means of assessing language skills in children is described by Templin (38). Tests of articulatory proficiency have been developed by Templin (37), Milisen (24) and others and a variety of sound discrimination tests is described in the literature. Although none of these tests was appropriate for this study, they were considered in the development of the present test battery.

3. Observations of mentally retarded children in communicative situations. Examination of existing speech tests indicated that some probably significant communicative attributes, such as the child's communicative initiative and complexity of ideation, were not adequately accounted for. To determine which attributes of existing tests were appropriate to the measurement of oral communicative effectiveness of mentally retarded children and which additional attributes might be identified, groups of mentally retarded children were observed as they engaged in communicative activities. Written descriptions of the communicative behavior of the children were then analyzed for identification of specific dimensions of oral communicative effectiveness.

4. Analysis of parent reports of mentally retarded children's communicative behavior. In order to take advantage of the parents' judgment of the importance of certain communicative attributes, parent descriptions of communicative behavior were analyzed in addition to analysis of the descriptions made by the research staff.

5. *Formulation of tentative definitions of significant communicative attributes.* Observation and analysis of the communicative behavior of mentally retarded children and the examination of existing speech and language tests suggested several speech attributes probably important in communicative effectiveness such as communicative initiative, intelligibility, complexity of ideation, etc.

6. *Devising of test situations and materials to evoke appropriate samples of communicative behavior.* In most previous research, formalized tests of articulatory proficiency and sound discrimination were used, as well as relatively standard procedures for analyzing the connected speech of the children. However, formal test situations for the assessment of an extended spectrum of attributes either were not used, were too lengthy, or were not constructed to evoke communicative speech which would lend itself to objective evaluation. In the present study, an effort was made to select and devise test materials and test situations which would meet the requirements of (1) stimulating communicative behavior which could be analyzed in terms of extended tive behavior which could be analyzed in terms of extended dimensions of communicative effectiveness, and (2) amenability to standardization of testing procedure.

7. *Pilot studies to test the tentatively defined communicative attributes and testing procedures.* After several pilot applications of the various tests were made with mentally retarded children (not subjects of the main experiment), revisions were made and the final form and procedures of the test decided upon.

Communicative Attributes Assessed by Tests

As a result of the above study and analysis, the following attributes were considered most important to evaluate in the oral communication of mentally retarded children:

I. Quality of communicative relationships
  A. Communicative initiative
    1. Immediacy
    2. Frequency
    3. Enthusiasm
    4. Involvement
  B. Ease in social situations
II. Quality of communicative behavior
  *A. Mode of communication (ratio of gesture to speech)
  B. Intelligibility
    1. Understandability
    2. Articulation
  C. Appropriateness of ideation
  D. Complexity of ideation
  E. Sentence structure
E. Sentence structure
    1. Length
    2. Sentence complexity
    3. Grammatical complexity
III. Over-all communicative effectiveness

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*Since assessment of communicative effectiveness in this study was derived from tape recordings, it was obviously impossible to evaluate gesture behavior. Consequently no ratings or statistical analyses were made of mode of communication.

Test Battery

To evaluate the above attributes, three main tests were devised: (I) the San Francisco Inventory of Communicative Effectiveness (SFICE) for the analysis of all test attributes in continuous speech in a communicative situation, (II) an articulation test for the assessment of articulatory proficiency in word contexts or in isolated sounds, and (III) a sound discrimination test for determining sound discrimination ability in word contexts.* Results of SFICE were evaluated through the use of a communicative attributes rating scale and a verbal output scale.

I. San Francisco Inventory of Communicative Effectiveness (SFICE)**

SFICE was designed to elicit a representative sample of the communicative behavior of mentally retarded subjects. Several exploratory studies with groups of mentally retarded children were done to determine which situations, materials, and procedures (1) evoked maximum verbal output, (2) evoked communicative behavior amenable to evaluation of various attributes of communicative effectiveness, (3) tested the child's responsiveness at various levels of communicative urgency and responsibility and (4) were capable of standardization of [illegible]

In general, it was found that the use of toys, dolls, and other objects, although more concrete and more interesting than pictures, engaged the interest of the children in the objects themselves rather than in talking about them, and encouraged non-verbal rather than verbal behavior. Materials for the final test form, therefore, consisted chiefly of pictures.

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*A fourth test (Teacher Rating Scale) was devised to obtain teacher ratings of the subject's communicative effectiveness. Results of initial testing suggested that this test in its present form would not yield useful information.

**See Appendix D, page 112.

Assessment of the child's communicative behavior in his relationships with other children, as well as with adults, was considered important. However, tests of peer relationships were not used because of difficulty encountered in their standardization.

In order to test the subject's response to communicative situations at various levels of urgency and responsibility, some of the test situations provided opportunity chiefly for spontaneous responses; others required responses to specific questions. Throughout SFICE, initial stimulation, such as, "Tell me about your house and family," was followed by further instruction, "Tell me more . . .," to encourage maximum response to a particular item.

All parts of the test employed specific materials, procedures and examiner questions. Thus, subjects' responses were made in standard contexts so that advantage would not be given one child over another in the judges' ratings of his intelligibility and language facility by virtue of the use of more productive or more familiar subject matter. Parts of SFICE are described below; a sample of the test is included in Appendix D.

Part A. Greetings

This part of the test was designed to initiate a communicative relationship between the child and examiner through a common social greeting and to test the child's ability to make the appropriate social response.

Part B. House and Family

This test section was designed to evoke conversational speech about a familiar topic. The house and family topic was chosen because in pilot studies the children responded well whenever this subject was introduced and because it is a topic familiar to most children. It was found that even institutionalized children responded well to this topic.

Test procedure, stimuli, and materials were chosen which provided the subject with a graded series of communicative opportunities from the more difficult "Tell me about your house and family" to the easier, "Here is a picture of a house and family, etc. Tell me more about your house and what you do there."*

Part C. Situational Pictures

The purpose of this section was to elicit further communicative responses which could be analyzed in terms of all the test attributes, expecially in terms of complexity of ideation.

Ten situational pictures were prepared from which two were finally selected as most productive of appropriate communicative behavior. Each picture and examiner's questions presented opportunities for a range of responses of varying complexity of ideation.

1. Birthday picture. This picture was used to invite the child's spontaneous description of a familiar situation. It was expected that the child who is capable of complex ideation may respond to the instruction, "Tell me a story about this picture," with more connotative description and complex interpretation than a subject whose ideational level is relatively low who may more likely respond with mere naming or simple description. No provision is made in the test procedure accompanying this picture to prompt the child to respond with more complex ideation.

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*The fewer standardized cues (questions, comments and promptings) proffered by the examiner, the greater the burden on the subject for spontaneous responses — hence, more difficult. The more standardized cues proffered by the examiner, the less the burden for spontaneous responses —hence, easier.

2. Classroom picture. Instructions accompanying this picture were designed to invite specific levels of description from simple naming to complex evaluation or generalization. The picture included a "conflict situation", i.e., boys fighting over a broken toy airplane, -- a topic which permitted questions as to the cause of the action, results of the action, and generalization about its implications.

Part D. Story

In order to provide the child with an opportunity to achieve maximum verbalization in a standardized situation, the examiner used the technique of telling the child a story and having him tell it back. Thus, the child did not feel so much personal responsibility for communication or the necessity for formulating his own ideas. The task was made even less formidable and maximally productive of verbal output by the use of large colored pictures which illustrated the story. The pictures were shown to the child as the story was told and shown again to provide him with appropriate cues as the child retold the story. The story and questions were designed to appeal to young children and to evoke enough continuous speech so that intelligibility could be judged and corroboration obtained of connective judgments previously made on other parts of the test. Essential features of the story which ensured subject interest were (1) elements of suspense, (2) a plot which included a family group -- a concept familiar to all subjects and providing characters easy to identify, and (3) birthday and Christmas episodes which were also familiar concepts to these children.

Testing Procedures

Complete directions for administering SFICE are given in Appendix D. This test was designed to be administered in one sitting of approximately 30 minutes. The entire test was tape recorded for later evaluation of the child's verbal communication under relatively quiet conditions, at 7 1/2 inches per second, using an Ampex recorder, Model 601, with an Electro-voice microphone Model 654.

Training Examiners

Training the examiners in administering SFICE consisted of (1) participation in the development of SFICE including trial use of various possible test procedures and materials with twenty-five or more mentally retarded children (not subjects of the study) and, (2) administration of the final test form to several more of these children in a sequence of training sessions in which uniformity of procedure was established.

Scoring of SFICE

The verbal communicative behavior of the child on SFICE was analyzed from the tape recordings through the use of the Communicative Attributes Rating Scale and the Verbal Output Scale.

Communicative Attributes Rating Scale for Scoring SFICE

The communicative attributes rating scale rated those communicative attributes described on page 38, which could be evaluated from the playback of tape recordings of the child's performance on SFICE. An 8-point scale was devised for measuring each of the attributes (see score sheet, Appendix D, page 131). These scales were further refined and modified after several preliminary judging sessions of randomly selected tape recordings of the subject's test performance.

Preparing Tapes for Communicative Attributes Rating

Major segments of the original tapes were re-recorded to include the House and Family, Situational Pictures, and the Story sections of the test. The tape recordings were drawn in random order from the 180 pre-therapy and post-therapy tests so that the judges did not know whether any given recording was a pre- or a post-test. Also, the name

COMMUNICATIVE ATTRIBUTES*

RATED ON COMMUNICATIVE ATTRIBUTES RATING SCALE

1. Immediacy	Communicative initiative	Quality of communicative relationships
2. Frequency		
3. Enthusiasm		
4. Involvement		
5. Ease of social relationships		
6. Understandability	Intelligibility	Quality of communicative behavior
7. Articulation		
8. Length of response		
9. Appropriateness		
10. Complexity of ideation		
**11. Over-all communicative effectiveness		Over-all rating of communicative relationships and behavior

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*The Communicative Attributes Rating Scale, utilizing the above attributes, and the Verbal Output Scale constitute the San Francisco Inventory of Communicative Effectiveness. The attributes in this inventory were determined by the present investigators to be significant components of communicative effectiveness after an extended period of observation and analysis of communicative behavior of mentally retarded children. These attributes were either not identified or were insufficiently defined in the literature or available tests.

**This attribute is individually rated. It is not a mathematical summation or composite of scores from the ten other sub-scales.

of the child and other identifying cues were omitted from the recordings to reduce the possibility of identification of any subject by the judges.

Training the Judges

To further ensure that the judges would not recognize individual children or know whether the recordings of SFICE were of experimental subjects or control subjects, or pre-therapy or post-therapy recordings, three judges were selected who were unfamiliar with the subjects of the study.

In order to achieve a high degree of agreement among the judges, a series of intensive training sessions were held during which criteria for evaluation were studied and discussed. The Communicative Attributes Rating Scale was then used in judging a number of samples of the tape recorded test which had been administered to subjects not included in this study. When agreement appeared to be relatively high and consistent from one sample to the next in this pilot training period, the judges, working independently from one another, rated the 180 recorded samples of pre- and post-SFICE tests of the 90 experimental and control subjects. After independently rating the first twenty-five samples and submitting these ratings for statistical recording, the judges compared a sampling of their ratings, analyzing any wide disagreement so that closer agreement and consistency might be achieved in subsequent independent ratings. This same review procedure was used again after the 75th sample had been rated and once more after the 125th sample. No ratings were revised in any of these review sessions.

Judge Consistency and Agreement

In analyzing results of any tests where appraisal of qualitative and quantitative change is in large part subjective, the establishment of a reasonable degree of consistency in examiner judgment is essential.

Because considerable diligence had been exercised in developing standards of examiner evaluation in the communicative attributes rating scale, it was expected that inter-examiner consistency of judgment would be relatively high. To determine the degree of agreement among the three judges an analysis was made of the correlations of ratings among the three judges for the 37 control subjects on the pre-therapy test for each of the items on the Communicative Attributes Rating Scale (including the three subtotals). From Table 7, Appendix E, page 155, it can be seen that the median correlation among the three judges over the eleven sub-scales ranged from .61 to .89.* It may safely be assumed that this level of agreement characterizes the full pool of ratings on the Communicative Attributes Rating Scale.

Verbal Output Scale for Scoring SFICE

The verbal output scale provided for the measurement of those communicative attributes which could not readily be judged from listening to tape recordings of the subject's performance on SFICE and which could be analyzed from written transcriptions of the subject's verbal communicative behavior. The following attributes were evaluated:

A. Length of response (words per response)
B. Sentence complexity
C. Grammatical complexity

Nine standard subject responses (Appendix D, page 137,) which were evoked by specific examiner instructions were selected from the written transcription for analysis of verbal output. These same responses were part of the tape recorded material which was also analyzed by the communicative rating scale.

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*For further discussion of reliability of the Communicative Attributes Rating Scale, see page 82.

A. Words per Response: This score consisted of the average number of intelligible words in the nine responses.

B. Sentence Complexity: The nine responses were classified as to sentence complexity and given the following ratings:

0 for no response or unintelligible responses

1 for single words (either a single word or a series of words strung together with no apparent relationship -- "dog cake girl")

2 for a phrase or fragment (with the nucleus generally two related words -- "boy eating" or "birthday party")

3 for a simple sentence

4 for a complex sentence

The rationale for scoring the above ratings is given in Appendix D, page 133.

To give a basis of comparison of the several responses of each subject and the responses of the different subjects, the total score of sentence complexity was divided by the number of sentences the subject spoke yielding a Mean Sentence Complexity as the final score.

C. Grammatical Complexity: Despite the difficulty in analyzing the complexities of language usage it was considered desirable to evaluate complexity of sentence parts as an important attribute of communicative effectiveness. Besides the scoring of sentence complexity, responses were analyzed and scored in terms of different parts of sentences, such as . prepositional phrases, and the different parts of speech, such as adverbs, etc. The rationale for scoring is given in Appendix D, page 133.

In rating the nine test responses a score of (1) was given for each of the following elements:

a. pronoun (if used as an adjective, no additonal credit was given)

b. adjective (participle) other than articles

c. adverb

d. prepositional phrase (including the 's for the possessive case)

e. conjunction other than and

f. participial phrase

g. infinitive phrase

h. verb phrase (verb plus auxiliary or auxiliaries)

i. direct object(s)

j. compound verbs

k. coordinative interjections, such as "well,. . ."

A demerit (-1) was given for certain grammatical errors, such as wrong case of pronoun ("Him is crying").

Final scores for grammatical complexity represented the total number of points obtained in all nine responses divided by the number of sentences in these nine responses.

Training Judges

Most of the scoring of the verbal output scale was done by experts in the field of English usage. A language consultant supervised the scoring.

Consistency of Rating

A language consultant checked the scores obtained on the verbal output scale and verified their accuracy.

II. Articulation Profile*

Test Design

As has been previously stated, the assessment of articulation in connected speech is the most appropriate measure of the contribution of speech sound production to communicative effectiveness. In the test battery, provisions are made for rating articulation of the subject's continuous speech in SFICE. However, such a rating is based on a general impression of articulatory normalcy without analysis of individual speech sounds.

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*See Appendix D, page 139.

It is a common clinical observation that a child may be able to produce speech sounds accurately in individual words and in isolation and still be unable to speak the sound correctly in continuous speech. This suggests that articulatory proficiency may develop gradually and that improvement and ability may be capable of assessment at several levels of skill in speech sound production. It has also been noted (24) that development and improvement in articulation may evolve in even more refined levels of ability according to the following sequence:

1. imitated sound
2. imitated syllable
3. imitated word
4. non-imitated speech responses

This general sequence affords even greater opportunity for the analysis and assessment of ability to produce speech sounds at various levels of development.

In the present study the Articulation Profile was designed to assess the subject's ability to produce all consonant speech sounds (except [ʍ]) at the various developmental levels: sound imitation, word imitation, and spontaneous word production, after the manner described by Milisen (24). Where test words allowed, each sound was also tested in initial, medial and final position.

Since it was desirable that the child name the word without imitating the examiner, test pictures which represented the test sounds were selected for their high recognition level among mentally retarded children. Preliminary studies with mentally retarded subjects using a large item pool of familiar words* determined in the selection of test words. Further study of the use of actual objects, photographs and line drawings to represent these test items determined that colored line drawings achieved almost as high recognition as photographs or objects and were not so distracting or cumbersome as actual objects. Pictures (colored line drawings) with highest recognition level were therefore chosen to represent the 24 consonant sounds. These pictures and the score sheet were then arranged in order of speech sound development reported by Poole (28), i.e., easiest and earliest learned sounds first-- [p][b][m] --and most difficult and latest learned sounds last-- [r][dʒ][tʃ]. A total of 66 pictures constituted the final test material.

Testing Procedure

The articulation test was designed to be administered in one sitting. The first part of the test consisted of asking the child to name each of the 66 test pictures. Where the child failed to recognize the picture he was prompted in various ways without the examiner saying the word for him. If several promptings failed, the examiner said the word and asked the child to repeat it after him.

After the picture naming, the child was asked to repeat the words spoken by the examiner. Only those words were tested (ratings 2 through 6) which were the names of previous picture items in which the subject produced the test sound incorrectly.*

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*Words taken from Horn's (15) list of familiar words and from other articulation tests.

Following the word imitation test, the subject was asked to watch the examiner's lips and teeth while the examiner said a sound three times after which he would be asked to say the same sound. All sounds in error on the word imitation test were presented in this manner.

Rating were made by the examiner from both auditory and visual impressions of the subject's responses. Also, the entire test was tape recorded for a later reliability check under relatively quiet conditions, at 7 1/2 inches per second, using an Ampex recorder, Model 601, with an Electro-voice microphone Model 654.

Rating Scale

The articulation rating scale or articulation profile consists of a 6 point scale in which (1) stands for correct production of sound, (2), (3), and (4) for degree of distortion of sound, (5) for substitution of another sound for the correct one, and (6) omission of the correct sound. The rationale for the use of such a scale derives from previous studies by Milisen and associates (24) and from preliminary use of the test scale in this study, in which it was observed that degree of speech deviation is represented reasonably well along this 6-point continuum. Although there are some exceptions to the appropriateness of applying this scale to severe speech sound distortions, such as a severe lisp for which there is no accepted phoneme, i.e., symbol, the rating scheme appeared to be as useful as any existing articulation rating scales.

The 6-point scale was applied to all three aspects of the articulation test: (1) the subject's naming of the test picture, (2) his imitation of the test word and (3) his imitation of the test sound. In each of these aspects of the test the examiner rated the subject's response at the time of the test.

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*Since the naming of pictures without benefit of imitation is more difficult than word imitation, it was assumed that if a subject could produce a specific test sound correctly from picture stimulation, he could also produce the same sound correctly if given the additional auditory cues in the word imitation test.

Training Examiners

Proficiency in the use of the rating scale of the articulation profile was developed by the four examiners from their previous experience in speech habilitation and from several training periods during the first phase of this study. Uniform techniques of administration were defined and adopted by the examiners as part of preliminary testing with a large number of mentally retarded children.

Reliability of Articulation Ratings

In the present study the ratings used in describing the behavior of the subjects in the articulation test were the individual ratings made by each of the four examiners of the research staff in the actual testing situation. Pre-therapy tests were administered by the four examiners with no knowledge of the type of therapy the subjects were to receive or which children would become the examiner's clients during the therapy phase of the study, although they did know which of the subjects were experimental and which control. Post-therapy tests were administered to each child by an examiner other than his former therapist.

Since the examiners did know which subjects were to be experimental subjects and which control subjects, it was considered important to determine to what degree the examiner's articulation ratings were reliable and in agreement with those of the other examiners. Reliability and agreement of judges' ratings were determined by comparing each judge's live ratings with ratings made by the other three judges of tape recordings of random samples of articulation test performance. For example:

1. Examiner A made live ratings of children's responses which were simultaneously tape recorded.
2. Examiners B, C, D rated a random sample of above tape recordings.
3. Examiner A's live ratings were then compared with the average of examiners, B, C, and D's tape ratings of the random sample.

To test for reliability a stratified random sample of 84, from the 180 pre- and post-tape recordings was selected in such a manner as provided for:

1. Equal representation of pre- and post-tests;
2. Equal representation of each sound in each of the three -- initial, medial, and final -- positions;
3. Proportionate representation of the three groups of subjects; and
4. Representation of the four examiners in the ratio that their live ratings bore to the total 180 tests.

To reduce the possibility of identification of subjects, the examiner's voice and all other clues were removed and only the subject's test responses were left on the tape. These individual tapes were randomized on a master tape, so that order of presentation could provide no clues as to subject group or pre-post condition.

Each of the four examiners then rated the sample of 84 tapes.

Each examiner's live ratings in the actual test situation were compared to the average rating of the same subjects by the other three examiners based on the taped tests.

The live versus tape correlations for each judge (Table 8, Appendix E, page 155), were unusually high: .90, .90, .91, .93. These results indicate that the judgments were accurate and consistent.

III. Sound Discrimination Test*

Test Design

Because of the traditional concept of the relationship of speech sound discrimination skills as a factor in speech development and speech training, and the fact that conventional therapy emphasized ear training, the inclusion of a sound discrimination test in the present study was considered desirable. Van Riper and Irwin (40) describe sound discrimination skill as involving two distinct functions: (1) the ability of the listener to distinguish between two different sounds in a second person's speech, and (2) the ability of the listener to distinguish between two sounds, one produced by himself, the other produced by a second person. In preliminary attempts to use existing sound discrimination tests with mentally retarded children, it was found that the tests were too confusing or complex, did not arouse and maintain interest, or included items at too high a vocabulary level for these subjects. This was particularly true of tests involving discrimination between sounds the subject produced and sounds the examiner produced. These limiting factors necessitated devising a simpler test of sound discrimination.

The sound discrimination test was designed to measure a subject's ability to discriminate auditorily between two words, phonetically similar except for one phoneme, both produced by the test examiner. Furthermore, the instrument was designed (1) to be within the recognition levels of the severely retarded child, using vocabulary which was familiar to him; (2) to sample all speech consonant sounds and their common substitutions and omissions; and (3) to employ a technique of testing which would arouse and maintain interest.

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* See Appendix D, page 151.

The final form of the test consisted of word-pair items arranged in the following order:

1. Short form: 18 items representing the 12 most difficult sounds for retarded children (4, 20) - six sounds having two test items each, six sounds having only one test item. It was considered desirable that each of the 12 sounds be represented by sound discrimination items incorporating the common substitutions and omissions both in initial and final positions. One test item was to be chosen for each category. However, items which could not be pictured and recognized by retarded subjects with a minimum of explanation, as determined in pilot studies, were omitted, and thus not all phonemic categories were represented equally. Where there was a choice of items for a specific category, that item requiring the least explanation and/or having the highest picture recognition score was chosen.
2. Long form: 67 items representing all consonantal categories except [ʒ] . This section of the test was devised to investigate further the ability of a subject to discriminate those sounds which he misarticulates, many of which are not represented in the short form of the test. The number of items in each sound category was limited by variables listed above.

Testing Procedure

The sound discrimination test was designed to be administered in two parts following the articulation profile. All 18 items of the short form were given to each subject. Only those items of the long form representing the speech sounds which each subject individually misarticulated were given to that subject.

Each item was tested by presenting the subject with two pictures. The name of one picture represented the test sound; the other a word rhyming with the first, different only in the sound corresponding to the test sound (ship:chip). The examiner first named the two pictures to be sure the subject could identify them. He then asked the subject to point to one or the other of the pictures and noted the subject's response. The subject was not allowed to see the examiner's mouth but only received auditory cues when the test word was presented. This was achieved by the examiner's holding a card in the subject's line of vision.

Rating Scale

The rating form (Appendix D, page 152) provided for scoring each item correct or incorrect, depending upon whether or not the subject correctly identified the spoken name of the item.

Training Examiners

The above procedures for administering the test were agreed upon and practiced by the four examiners in training sessions prior to the pre-therapy testing.

Consistency of Ratings

No analysis of consistency was considered necessary for the ratings of this test, since the test response did not require a judgment by the examiner.

Selection of Subjects

Criteria for Selection

With the increased emphasis on public school training of mentally retarded children, it was considered desirable to conduct the present study with children in the public schools. It was further considered important to include in the experiment a representative sample of children with severe mental retardation, since this group especially suffers from severe communicative disorders.

The final criteria met in the selection of children for this study were as follows*:

1. Current enrollment in public school classes for mentally retarded children
2. Intelligence quotient between 40 and 79
3. Chronological age 7 through 15
4. Speech
    a. The child should not be mute.
    b. The child should have a significant articulatory deviation (See also 5. Physical condition).
    c. The child should not stutter.
5. Physical condition
    a. The child should have normal hearing in at least one ear, as determined by an individual pure tone audiometric test.
    b. The child should have no apparent organic anomalies or physio-neurological disturbances, as indicated by school records and observation by a speech pathologist.

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*For specific information about each subject see Appendix B, page 98.

6. Emotional development

   The child should be emotionally stable to the extent that group stimulation will not intensify his problem unduly, that he will react to learning situations, and that his presence is not inimical to the educational or emotional welfare of other children, as indicated in his school record, teacher reports and observation by speech pathologist.

7. Language background

   The child should come from a home situation in which English is the only spoken language. In the case of children from other-language or bi-lingual families the influence of the other language on their speech may introduce additional variables which could complicate the matching of subjects in the experimental and control groups.

8. Racial background

   The child should be of the Caucasian race. Aside from the additional variation in speech problems which a bilingual influence might introduce, the majority of intelligence tests used to determine the intelligence quotients of children have been standardized on white, English-speaking populations. In order, therefore, to be more certain that the IQ as measured was relatively valid for each subject, only white children were chosen.

Screening Procedure

Meetings were held with county, district, and city school administrators and directors of special education in which the project was explained and discussed with them and their cooperation enlisted. Permission was requested to allow members of the research staff to examine the school records to obtain necessary data for subject selection and to administer a pure tone audiometric test and a battery of speech tests for screening purposes to 1,032 children whose records showed that they might qualify as subjects. On the basis of the screening procedure, 94 subjects who satisfied the project criteria were finally selected. Because of circumstances beyond control, four subjects were eliminated from the study, leaving an N of 90 as the final sample.

Description of Sample

The 94 subjects initially selected for the project were assigned to control and experimental groups so that the groups were relatively well matched on important variables. Differences in chronological age, mental age and intelligence quotient among the control and experimental groups were tested by means of analysis of variance and found to be not significant. Also the difference in sex distribution among these groups was not significant. (See Table 2A and 2B page 54.)

The 56 children who were assigned to the experimental groups were enrolled in schools in (1) San Francisco City and County, (2) San Mateo County, and (3) Marin County. Restricting the experimental sample to 56 subjects and to the schools of these three counties was necessary because the four therapists who participated in the experimental phase of the study could not provide therapy in any larger geographical area in the school day. Subjects of the experimental groups were further divided into small therapy groups of from two to five children. Although having as many as five children in each therapy group would have been desirable, most groups were smaller because some of the children in a particular school were ineligible for the study and it was not possible

TABLE 2A

A COMPARISON OF MEANS AND STANDARD DEVIATIONS FOR EXPERIMENTAL AND CONTROL GROUPS ON C.A., M.A., and I.Q.

	N	Mean	S.D.	F
Chronological Age				
Group E_1	24	135.29	19.68	
Group E_2	29	129.14	21.31	n/s
Group C	37	123.27	27.80	
Mental Age				
Group E_1	24	71.50	14.46	
Group E_2	29	71.69	15.90	n/s
Group C	37	67.73	16.39	
Intelligence Quotient				
Group E_1	24	53.17	10.10	
Group E_2	29	58.03	10.97	n/s
Group C	37	55.73	10.51	

TABLE 2B

A COMPARISON OF MALE AND FEMALE COMPOSITION OF EXPERIMENTAL AND CONTROL GROUPS

	Group E_1	Group E_2	Group C	TOTAL
Male	16	20	23	59
Female	8	9	14	31
Total	24	29	37	90

d f = 2 X^2 = .69 n/s

to transport children from other schools to augment the small groups.

The 38 children of the control group were enrolled in schools in (1) Sacramento City, (2) Richmond, (3) Pacifica, (4) Berkeley, (5) South San Francisco, and (6) Mill Valley.

Experimental Group (Group E_1)

Twenty-six children (24 in final sample) were assigned to Group E_1 after the pre-therapy testing had been completed. As indicated in Table 6, page 102, this group was further divided into therapy group A, B, C, D, E, F, and G of three, four, two, four, four, five and four subjects respectively. Group E_1 subjects received conventional therapy in the study.

Experimental Group (Group E_2)

Thirty children (29 in final sample) were assigned to Group E_2 in therapy groups H, I, J, K, L, M, N, and O of three, four, four, four, four, five, three and three subjects respectively. This group received communication-centered speech therapy.

Control Group (Group C)

The 38 children (37 in final sample) in Group C were not assigned to any sub-groups and did not receive speech therapy.

Selection of Examiners and Therapists

Two speech therapists were employed during the first year and a half of the study to assist in the test development and preparations for the experimental phase. Two more speech therapists were added to the research staff during the last year and a half to assist in the final stages of test development, in the administration of the test battery, and in conducting therapy with the experimental groups.

All therapists had extensive experience with children - including the mentally retarded - in therapeutic settings. Of the therapists, three either qualified for or held basic clinical certification in speech from the American Speech and Hearing Association, one held advanced clinical certification, and three held master's degrees in speech therapy. Three were female, one male.

Administering the Tests

All tests in the test battery used in this study were administered to experimental and control subjects immediately prior to the therapy period and again immediately after the therapy period. Initial testing required one month beginning November 1, 1958.

Four members of the research staff who had participated in developing the final form of the test battery and who had engaged in a number of training sessions in administering the tests to mentally retarded children carried out the testing program. Since the test examiners also were to serve as speech therapists following the pre-testing situation, group assignment of subjects and therapists was withheld until all pre-testing had been completed, thus minimizing the factor of examiner pre-test bias within the experimental populations.

The following schedule of testing was adhered to as closely as possible, though some exceptions were necessary.

1. San Francisco Inventory of Communicative Effectiveness: This test was administered first. Because the establishment of a social relationship between the subject and the examiner was one of the functions of SFICE, it was desirable to begin with this test, when the examiner was still unknown to the subject. (The entire test was tape recorded).

2. Articulation Profile: This test was second in the sequence. It preceded the sound discrimination test because the phonetic errors on the articulation test determined which items of the sound discrimination test (long form) were to be given to any one subject. (The entire articulation test was tape-recorded).
3. Sound Discrimination Test: The entire short form was administered to each subject; long form items were administered as described above.

Tests were conducted individually, one subject and one examiner being along in the testing room. In most instances recording equipment was located immediately outside the test room. A technician set up all recording equipment and operated it to maintain evenness of recording level throughout any given test.

Fatigue, interest and attention factors often necessitated rest periods during and between the articulation and sound discrimination tests. This was especially true for subjects whose tests, because of a large number of articulatory errors, tended to have a duration of more than 30 - 40 minutes. Occasionally it was even necessary to space tests one to two days apart.

Post-therapy testing was done by three of the four original examiners (one examiner was ill during post testing) immediately following termination of therapy. Those two examiners who were the therapists with Experimental Group 1 did all the post-testing on Experimental Group 2. One of the two examiners who had done therapy with Experimental Group 2 performed the post-testing of Experimental Group 1. In this manner no children were tested by their own therapist. The Control Group was post-tested using all three examiners. In very few instances did the same examiner administer both pre- and post-tests on any given subject.

Therapy

The experimental design of this study provided for a comparison of changes in communicative effectiveness among subjects (1) who received speech training and those who did not, (2) who received one type of speech training (conventional) and those who received no therapy, (3) who received a different type of speech training (communication-centered) and those who received no therapy, and (4) who received conventional speech therapy and those who received communication-centered speech therapy.

Definitions of Therapy Approaches

Two therapy approaches were used in this study: conventional speech therapy and communication-centered speech therapy. The definition of conventional speech therapy was obtained from current literature in the field of speech habilitation (2,6,8,29,41,44). No effort was made to incorporate in this definition the many modifications of conventional therapy that speech therapists may have made in the development of their own speech therapy techniques. The description of conventional speech therapy given here is relatively brief since its features are so frequently described in available literature. A more extensive description of communication-centered speech therapy is presented here since it has been only briefly described elsewhere (18). Examples of therapy outlines are included in Appendix C for both approaches as used in this study.

Conventional Speech Therapy

A major assumption in conventional speech therapy is that the ability to hear the correct sound and to discriminate a correct from a misarticulated speech sound is necessary before a client can learn to produce the correct form. Consequently, considerable time is spent in traditional speech therapy in ear training as a preliminary step to practice in speech production.

Ear training follows a part-to-whole sequence. The child or client is first taught to hear and recognize the correct sound and to discriminate between the correct and incorrect speech sound (when misarticulated or distorted) as isolated sounds, apart from syllable or word contexts. This listening exercise proceeds from sound in isolation to sound in syllable; then in words and, finally, in phrases and sentences, with the therapist giving the sound, syllable or world stimulus and the child then indicating his ability to identify the correct and incorrect stimuli.

As the child becomes proficient in the recognition of the correct sound or in the discrimination of a correct sound from the error sound, he receives instruction in the correct manner of producing the sound. Here again, the sound is practiced first in isolation, then in syllable, in a word, and finally in additional words, phrases, and sentences.

In conventional speech therapy it is sometimes recommended in the early stages of sound production that words be selected which contain the practice sound but words which the child does not habitually use in his speech. The explanation for this procedure is that for the familiar word the child has a faulty configuration with which he tends to respond (41).

When the child is able to produce the sound correctly, practice is given in production of the sound in carry-over exercises. These may consist of brief periods of conversation, of word lists taken from the classroom vocabulary, or of sentences or phrases which may or may not occur in the child's daily speaking activities (2,6,8,29,41,44). In all these exercises the child is reminded or reminds himself when he produces the practice-sound incorrectly.

The therapy context in which speech is practiced in the conventional approach is chiefly that of an individual relationship of child to therapist in game, drill, and story activities. The therapist gives the stimulus to the child, the child gives back to the therapist an approximation or imitation of the stimulus. It is not essentially a communicative context but an imitative context in an individual rather than a group relationship.

Communication-Centered Speech Therapy

A major assumption in communication-centered speech therapy is that refinements of communicative behavior, including correct speech production, are motivated by and evolve from successful communicative relationships. Thus the chief emphasis in therapy is on arranging activities in which the client can have successful communicative experiences and, at the same time, encouraging and giving practice in appropriate adjustive behavior that will further ensure this success. These successes alone are considered to be effective stimulation for speech and language improvement as is apparent in normal speech development and in the rapid speech improvement which many children show in the communicative interaction of nursery school and kindergarten experience. However, to hasten the acquisition of correct speech, communication-centered therapy depends not only upon successful communicative relationships to effect speech improvement, but also upon direct speech practice. The verbal communicative behavior which naturally accompanies communicative relationships is utilized as the speech and language practice material of communication-centered speech therapy, in which the specific misarticulated speech sound may be practiced and improved.

The therapy context of communication-centered speech therapy in which speech and adjustive behavior are practiced is that of group relationships -- children relating to other children as well as to the therapist -- in communicative activities which simulate appropriate real life experiences of the particular group under therapy. The group usually consists of six to eight members, although with some children, such as the mentally retarded, smaller groups are more productive. Group members are selected in terms of balanced group structure, not one boy and four girls, not all withdrawn or all aggressive, so that effective group therapy may be conducted.

The essential procedures of therapy in this approach may be illustrated in the following five related aspects of communication-centered speech therapy:

1. Determining the Needs of the Group.-- Successful communicative relationships in the therapy group are best achieved if the needs of the group and group members are recognized and circumstances arranged in therapy to permit acceptable expression and satisfaction of these needs. As group therapy is conducted, routines of procedure are established within which the group may function comfortably and freely without authoritarian control on the one hand or undue permissiveness on the other. With groups this small, rigid classroom control is not necessary. Therefore, activities may be conducted which reveal problems of rejection, overdependence, withdrawal, hostility, attention-getting, etc. The therapist's awareness of these problems is essential to the planning of therapy to achieve effective group process and appropriate satisfaction of these individual needs.

2. Unifying the Group.-- A major advantage of group therapy is the influence the group has on its members. Opportunities for interaction with other people, especially with other children, are always available

to the client. From these interactions he gains feelings of success and confidence and the license to interact, to communicate with others in his daily life experiences.

In order for the group to make its greatest contribution, there must be a degree of unification and cooperation, a group balance or structure which encourages the comforatable inter-relationship of group members. This is accomplished through arranging activities which encourage cooperative participation of more than one child. For example, coloring a picture alone does not invite group interaction as does a group task of coloring a large picture together. Activities are arranged so that each child may participate with others at a level which ensures success for him and which makes it more desirable for him to relate cooperatively with others than in an overdependent, aggressive, or withdrawn manner.

3. Arranging Activities Which Evoke Verbal As Well As Non-verbal Communication.-- In the process of group unification, interaction may be achieved through both verbal and non-verbal communicative behavior. Success in non-verbal communication is often the more realistic goal. This is neither surprising nor discouraging. In normal speech development, successful communication at the non-verbal level precedes and is essential to the development of successful verbal communication (18,31). This sequence of non-verbal to verbal speech learning is at once a most critical and most powerful feature of speech therapy. It recommends the constant emphasis of the motivation to communicate as the basic motivation in speech learning.

The motivation to communicate is practically defined as the desire to influence other people. This is the obvious purpose of communication: we communicate with others chiefly that we may influence and control others. Success in communication with others has at least two important by-products: one is the increased desire for further communicative interaction; the other is the increased motivation and necessity for more refined communicative skills for carrying on this interaction. For example, going from the simple to the complex, a child may influence others (1) by nodding his head when asked if he wants something, (2) by answering yes or no, or (3) by initiating the request himself. It would be expected that success in (1) would be a necessary preparation for the child to try (2). It may also by assumed that correct production of the sound [s] in *yes* may likewise depend upon success in (2) since a correct [s] is an utlimate refinement of the communicative behavior involved.

In speech therapy the motivation to communicate is utilized by arranging successful communicative experiences for the client at higher and higher levels of communicative responsibility in which more and more verbal communicative behavior is evoked and greater refinement of speech is evolved.

4. Arranging Activities Which Evoke Specific Adjustive Behavior And Specific Speech Responses.-- In the communicative interaction of group therapy the expression and satisfaction of individual needs is encouraged in several important ways:

a. through the uncritical *acceptance* by the therapist and other group members of most of the client's behavior,
b. through the arranging of activities to *evoke* more acceptable behavior,
c. through the *encouragement* by the therapist and group members of more acceptable behavior,
d. through the *teaching* of more effective and appropriate ways of behaving in various communication situations.

The goal, then, of communication-centered speech therapy is to improve the client's communicative effectiveness through improvement of his communicative relationships, his adjustive behavior and his speech production. Therapy, therefore, is designed to help the client acquire more effective ways of behaving in his interaction with others, including more effective ways of speaking to others. By commendation and encouragement, by example and demonstration, and by rehearsal in realistic communicative activities, the client gains the desire for more effective behavior and has the repeated opportunity to practice this behavior among his peer group as well as with adults.

The child learns to share with others, to take turns, to express his ideas, to relate to other people, to participate in discussions, games or other social activities. In any of these activities, appropriate speech responses are encouraged and practiced, such as "May I have a turn?" "Yes," "Thank you," "Hello." Such responses are in themselves useful tools in effective relationships. They are profitably rehearsed in situations which naturally require the use of such responses. Thus, in the learning of appropriate adjustive behavior, the client also learns appropriate speech responses which have daily value and communicative power for him. Because of their daily usefulness, these responses tend to be learned with optimum permanence.

5. Practicing Specific Speech Sounds in Context and Isolation.--It is a feature of communication-centered speech therapy that the learning context be as much like the speaking situations of the client's daily life experiences as possible. This concept receives support from the learning theory principle of appropriateness of associational cues which suggests that the associational cues of the practice or learning situation be similar to the cues in the performance situation. In the

improvement of specific speech sounds it would thus be expected that the correct sound would be learned most effectively when:

a. it is practiced in a communicative context in preparation for use in daily communicative situations,

b. it is practiced in speech responses which occur frequently and are optimally useful in daily communicative experiences, and

c. it is practiced in the whole word within the communicative context, with part practice of isolated speech sounds as necessary but with frequent return to the whole word for learning in the appropriate context.

To illustrate this principle: In teaching a child with a [t] for [k] sound substitution to say "come in" instead of "tum in," having the child seated before a therapist to practice a list of [k] words provides only such limited associational cues as an adult seated, the child seated, a list of [k] words, the word "come," imitation of the adult. On the other hand, if the child practices saying "come" while opening the door for someone else, the more meaningful associational cues include a door, a knock at the door, the child walking to the door, the child reaching to open it, the child opening it, another child standing and waiting to come in. Here, the word "come," is in a more enriched communicative context. Saying "come in" demonstrates its potency in eliciting from the listener-participant an appropriate real-life response.

Practice of the [k] sound in this situation is thus accomplished in the context of realistic communicative interaction and the context of a useful communicative response. In addition, it is also frequently desirable to practice the [k] or other sound in isolation, taken momentarily from the communicative context. In such part-practice, any of the traditional speech training techniques of auditory discrimination and speech sound production, including mirror work and tongue placement, may be appropriate and useful. The important thing is that the learning sequence be whole-part-whole with more emphasis on contextual practice than on sound in isolation.

Application of the principles of communication-centered speech therapy in the five steps described above can best be achieved in the context of group therapy where children relate to one another as well as to the therapist. In school speech habilitation programs the common practice of working with children in groups, rather than individually, provides ideal circumstances for employing communication-centered speech therapy in the usual school setting.

From the above discussion there appear important similarities as well as differences in conventional and communication-centered speech therapy.

The two approaches are alike in that:

1. They both employ the common techniques of ear training and speech production.
2. They both may be done with several children at the same time.
3. They both provide for carry-over practice in communicative situations using the social responses of the client's everyday speaking activities.

Major differences in the two approaches are:

1. The central motivation in speech learning in communication-centered speech therapy is the motivation to communicate, whereas in conventional therapy the central motivation is the desire to imitate the correct model provided by the therapist.

2. In communication-centered speech therapy, group structure and group process are essential tools of therapy, whereas, in conventional speech therapy, group relationships are important only to the effective conduct of carry-over practice.
3. Carry-over practice in communication-centered speech therapy is built into the total learning experience, whereas in conventional speech therapy it is reserved until the end of a particular learning sequence. The obvious illustration of this difference is the whole-part-whole speech learning sequence of communication-centered speech therapy as compared with the part-to-whole sequence of conventional speech therapy.

It is difficult to illustrate a process of group therapy or even to describe its procedures, for in actual therapy, the approach must change with the changes in group structure as well as with variations of individual behavior. Nevertheless, for purposes of suggesting how the principles of communication-centered and conventional speech therapy may be applied, several outlines of speech therapy sessions as conducted in this study are included in Appendix C, page 104.

Composition of Therapy Groups (See Appendix B, page 98)

Following pre-therapy testing of all subjects, therapy groups were formed and therapists assigned to each group. Though it would have been desirable to group children on factors such as chronological age, mental age, social competence, and ability to work together, geographical distribution of the subjects did not permit this. In most cases only three to four subjects were clustered in any one school, thus precluding a choice in make-up of therapy groups. For schools in which formation of more than one group was possible, grouping was decided by the delegated therapist, using factors mentioned above as the criteria for assigning a specific subject to any one group.

Geographically the subjects were distributed into four districts or areas, in each of which one therapist could serve within the time limits of the school day. Children of each of the four districts were assigned to the experimental groups so that there were comparable numbers of educable and severely retarded children within the two experimental populations.

Training the Therapists

Four speech therapists were employed in this study, all of whom had had experience in speech therapy with normal as well as with mentally retarded children. Prior to the beginning of therapy with experimental subjects, all therapists were given additional training in the technique they were to use in the study, two therapists receiving training in communication-centered speech therapy as described in this study (Page 60), two therapists receiving training in conventional speech therapy as described in this study (Page 58). Two groups of mentally retarded children, comparable to children in the study, were used as subjects during this training period. Duration of the training period was approximately one month. During this time the children were seen for approximately one-hour periods four days each week. Therapists were observed and evaluated by college personnel who were experts in the use of each technique. Therapists also participated in discussions of theory and assumptions underlying the respective techniques. Training in the two techniques was kept as discrete as possible.

Therapy Program

All therapy was scheduled within hours of the public school day. Duration of the therapy session was one-half hour, given four days each week. Fifteen minutes were allotted after each therapy session for recording therapy notes. In the pilot therapy study as well as in the main experiment, the research staff agreed that one-half hour of therapy time was most appropriate for severely retarded children.

Because of the distance between schools, for which travel time had to be allotted each therapist, the greatest number of groups which could be given therapy in any one day by any one therapist was four. One of the therapists was able to serve only three groups.

The fifth day of each week was spent in planning therapy for the succeeding week and reviewing past therapy notes, both activities being geared toward maintaining purity of therapy technique, i.e., avoiding overlap between conventional and communication-centered therapies.

Before initiating therapy with any given subject, each therapist was given the opportunity to observe his subjects in the classroom. This was done for purposes of assessing in a realistic situation the child's spontaneous speech, oral language usage, and social behavior.

Each therapist was given the freedom to decide what sound, or sounds, a child was to work on in therapy. In general the following factors determined this choice:

1. Ease of production for the child, the easiest sounds given preference.
2. Influence of a sound upon the child's intelligibility, with preference generally given to those sounds apparently causing the greatest reduction in intelligibility.

3. Frequency with which certain sounds are misarticulated by other members of the group, with preference given to these sounds.
4. Length of time for successful correction, preference being given those sounds which probably could be corrected quickly.

Therapy was initiated January 7, 1959 and terminated April 30, 1959, giving fifteen weeks of actual therapy.

PART FOUR

RESULTS

Statistical Procedures

The major statistical problem of this study was evaluating the relative change in communicative effectiveness resulting from the four-month therapy period between (1) the experimental groups and control group, (2) the two experimental groups, and (3) the educable mentally retarded and severely mentally retarded subjects.

Because, in selecting subjects for the experiment and assigning them to the three groups, little control could be exercised as to their existing communicative level, a method of adjusting these pre-therapy differences was desirable. For this reason, analysis of covariance was selected for evaluating the relative mean gains between the various groups of subjects.

The advantages are easily perceived. Emphasis was on net results from which it was desirable to exclude influences of pre-therapy differences between the various groups. In addition, a highly sensitive statistical test was desired because changes in communicative effectiveness were expected to be relatively small as a result of so short a period of therapy. At the same time, in selecting analysis of covariance, certain assumptions were made in the data analysis, such as normality in the distributions of ratings and homogeneity of variance. In general, these assumptions were met, those few exceptions being noted where they occur.

In evaluating the relative changes in communicative effectiveness of the two experimental groups and the control group, covariance analysis of the pre- and post-therapy ratings was made between (1) the conventional

and the communication-centered therapy subjects; (2) the conventional therapy subjects and the control subjects; (3) the communication-centered therapy subjects and the control subjects; and (4) betwen the educable mentally retarded subjects in the two experimental groups and the severely mentally retarded subjects in the two experimental groups. This same pattern of analysis was carried out for each of the communicative attributes measured by the four major rating scales used in the study. The results of the covariance analyses are summarized below and the F ratios derived are shown in the appendix relating to the particular test, together with other pertinent data (Appendix F, pages 156-171).

For the purpose of interpreting results of these tests, significant differences in the degree of speech improvement were considered to have occurred when the F ratios derived from the covariance analysis were significant at the 5% level. This implies that only five times out of a hundred would differences as large or larger be expected to occur by chance.

Results of Articulation Profile

Data Obtained

Nine different articulation scores were analyzed in comparing pre- and post-therapy results of the articulation profile: three scores from picture naming responses, one for each of the three positions initial, medial, and final; three scores from word imitation responses, one for each position; one score from isolated sound imitation; and two total scores, one the total of all articulation ratings —initial, medial, and final— of the picture responses, the other the total of all articulation ratings of the word imitation responses. Of these scores, total picture, total word, and sound imitation are most important as

as indicators of proficiency in articulation, subscores merely suggesting position of sound which improves most readily or is least defective.

Results of the Articulation Profile appear in Appendix F, pages 165-169. On this test, low scores indicate good performance; high scores indicate poor performance.

Covariance Analysis of Articulation Profile Data

1. Conventional therapy group (E_1) versus communication-centered therapy group (E_2): (Table 19, page 168)

Significant differences in articulation improvement between these two groups were found on the three total scores and on two of the subscores. In two instances the F ratios were significant at the 1% level; the other three at the 5% level. Precise interpretation of these F ratios is made somewhat difficult by the frequent significant differences between the group regression coefficients. However, the main conclusions are not questioned by this qualification.

2. Conventional therapy group (E_1) versus control group (C): (Table 17, page 166)

Significant differences between these groups were not found on any of the items in the articulation profile test.

3. Communication-centered therapy group (E_2) versus control group (C): (Table 18, page 167)

Significant differences in articulation improvement between these groups were found on all scores of the articulation profile, on subscores as well as total. They were particularly impressive, exceeding the 0.1% level, on Total Picture and Total Word scores.

The possibility that differences on two of these items were not as significant as the F ratios would indicate is suggested by the fact that significant F ratios between regression coefficients were found on the Final Word and Total Word scores. This indicates that on these two items, the between-groups F ratios were somewhat inflated. However, because of their high level of significance it is probable that even without this undesirable inflationary effect they would still remain well above the acceptable 5% level of significance.

4. Educable mentally retarded versus severely mentally retarded subjects: (Table 20, page 169)

Significant differences were found on only two of the nine scores on Medial Picture and Final Word although scores on Total Picture and Total Word approached significance in favor of the educable group. In general the F ratios were considerably below the 5% acceptable level of confidence.

Interpretation of Data -- Articulation Profile

In general the results of the articulation profile support the hypotheses that communication-centered speech therapy helps to improve articulation of mentally retarded children more than no therapy whatsoever; that communication-centered speech therapy helps to improve articulation in mentally retarded children more than conventional therapy, and that the articulation of both educable and severely mentally retarded shows improvement as a result of therapy with a slight difference in favor of the educable group.

Results of Sound Discrimination Test

Scores were obtained for all subjects on the 18 item short form and for each subject on those items of the long form which corresponded to the misarticulated sounds of the articulation profile. Table 21, Appendix F, page 171 shows that significant differences were not found to exist between any of the groups on the short form test results. Since short form results showed no improvement, even though the most frequently misarticulated sounds were represented in the short form, the long form results would not be expected to reveal significant differences either. Long form results of the sound discrimination tests were, therefore, not analyzed in the study.

Results of San Francisco Inventory of Communicative Effectiveness (SFICE)

Performance on SFICE was tape recorded to permit extensive and objective evaluation of the subjects' communicative behavior. The tape recordings were rated in terms of such attributes as communicative initiative, intelligibility, etc. through the use of the Communicative Attributes Rating Scale. Analyses of written transcriptions of the tape recordings were made in terms of sentence complexity and grammatical construction through the use of the Verbal Output Scale.

Results of Communicative Attributes Rating Scale (for analyzing SFICE)

Data Obtained

Fourteen scores were analyzed in comparing pre- and post-therapy results of the communicative attributes rating scale: one score for each of the eleven attributes rated on the scale — immediacy of response, frequency, enthusiasm, involvement, ease of relationship, understandability, articulation, length of response, appropriateness, complexity of ideation, and over-all communicative effectiveness; a composite intelligibility score, consisting of the sum of the understandability and articulation scores; a composite communicative initiative score, consisting of several scores of communicative relationships; and a total score of all ten attributes rated except the over-all communicative effectiveness rating. (See Score Sheet, Appendix D, page 131)

Changes in communicative attributes scores made by the three groups of subjects in the study are presented in Appendix F, pages 157-161, which indicate that subjects of all groups improved their scores, including subjects of the control group.

Covariance Analysis of Test Ratings on Communicative Attributes Rating Scale

1. Conventional therapy group (E_1) versus communication-centered therapy group (E_2): (Table 11, page 160)

Significant differences between these two groups were not found on any of the items on the communicative attributes rating scale (including the three composite scores).

2. Conventional therapy group (E_1) versus control group (C): (Table 9, page 158)

Significant differences between these groups were not found on any of the items on the communicative attributes rating scale with the exception of item Imm., "Immediacy of Response." It should be noted that this attribute was one where there was comparatively low correlation of expert judge agreement. In a second item of the test, namely item Inv., "Involvement," results closely approached significance.

3. Communication-centered therapy group (E_2) versus control group (C): (Table 10, page 159)

Significant differences between these two groups were not found on any of the items on the communicative attributes rating scale (including the three composite scores).

4. Educable mentally retarded subjects versus severely mentally retarded subjects: (Table 12, page 161)

Significant differences between these two groups were not found on any items of the communicative attributes rating scale with the exception of item App., "Appropriateness." On this single attribute, results did indicate a significantly greater degree of improvement for the educable mentally retarded subjects than for the severely mentally retarded.*

Interpretation of Data -- Communicative Attributes Rating Scale

In general, results of the communicative attributes rating scale were inconclusive. No differential improvement was found with a few exceptions most reasonably attributable to chance.

Results of Verbal Output Scale (for analyzing SFICE)

Data Obtained

Four scores were analyzed in comparing pre- and post-therapy results of the verbal output scale: number of words per response, mean sentence complexity, grammatical complexity, and a parts of speech score. In analyzing parts of speech scores it was found that there were large, unexplained differences between variances in these scores and widely varying pre-post correlations, e.g., communication-centered, .69 and control -.04. Because of these variations, computation of F ratios was not appropriate for the parts of speech scores. (See Score Sheet, Appendix D, page 138)

Changes in verbal output scores made by the three groups of subjects in the study are presented in Appendix F, Tables 13-16, pages 163-164.

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*The significance of this improvement is questionable because the judges' ratings of this attribute were restricted to a narrow range of the continuum.

Covariance Analysis of Test Ratings on Verbal Output Scale

Results of the verbal output scale indicate improvement only on the grammatical complexity score in which the conventional therapy group (E_1) showed a significant difference in improvement over the control group (C); the communication-centered therapy group (E_2) showed a difference in improvement approaching significance.

Interpretation of Data -- Verbal Output Scale

The hypothesis that speech training improves the speech of mentally retarded children is supported by results of the verbal output scale in terms of grammatical complexity but not in terms of sentence complexity or length of response. The other two hypotheses were not supported by results of the verbal output scale.

Summary of Results

As indicated in Part Two, the major hypotheses of the present investigation are as follows:

1. The speech of mentally retarded children can be improved through speech training.
2. Speech proficiency of mentally retarded children can be more effectively improved with an approach based on duplication of real-life experiences (communication-centered speech therapy) than with a drill-type (conventional speech therapy) approach to speech training.
3. The degree of speech improvement of the educable mentally retarded is greater than that of severely mentally retarded as a result of the two major types of speech training used in the investigation.

In addition to testing these hypotheses, a further purpose and essential aspect of the study was the development of several tests with which various attributes of communicative effectiveness of mentally retarded children could be assessed. A discussion of the usefulness of the test battery developed in this study is contained in Part Five.

As to the tests of the hypotheses, the articulation profile and grammatical complexity scale were the only measures which showed consistent significant difference in improvement between experimental and control groups. In other attributes of communicative effectiveness, subjects of both experimental and control groups showed improvement.

No doubt there are several reasons for this, including the possibility that there actually were no changes as a result of therapy other than in articulatory ability. Other reasons may be: (1) maturation of all subjects which contributed measurable changes in communicative effectiveness, (2) learning on the initial test which carried over to the post-therapy test, and (3) insufficient length of therapy for improvement to be great enough to be measured. Despite this lack of difference in improvement as measured by the communicative attributes test, speech improvement in terms of articulation was demonstrated in support of the major hypotheses of this study. The following answers were obtained to the specific questions this study was designed to explore.

1. Do children with articulatory deviations who are in special day classes for the mentally retarded show significant improvement in communicative effectiveness as a result of specialized speech training?

The answer to this question is "Yes," with respect to two of the attributes of communicative effectiveness, namely, articulation and grammatical complexity. Significant improvement in other speech attributes was not demonstrated in the test results for either experimental group. With respect to articulation, results indicate that communication-centered speech therapy produced significant improvement in the mentally retarded subjects of this study. Improvement of articulation of the subjects who received conventional speech therapy was not statistically significant. Improvement in grammatical complexity was statistically significant for the conventional therapy subjects and approached significance for the communication-centered.

2. Do children with articulatory deviations who are in special day classes for the mentally retarded show greater improvement in communicative effectiveness when given communication-centered speech therapy than do comparable children in special day classes who are given conventional speech therapy?

The answer to this second question is again "Yes," with respect to articulation. Statistically significant improvement in articulation was produced in subjects who had received communication-centered speech therapy, whereas improvement in articulation made by subjects who received conventional therapy was not statistically significant. Except in a few isolated instances test results do not indicate significant improvement with respect to other speech attributes in either of the experimental groups.

3. Is there any relationship between the level of intellectual functioning in the mentally retarded child and the amount of speech improvement which results from speech training.

The answer to this question based on a comparison of the articulation improvement of educable and severely mentally retarded children is that the relationship approaches significance. In other attributes of speech improvement the answer is a qualified "No." The few findings pertaining to differences in communicative attributes other than articulation do not present a cohesive and systematic pattern and are, therefore, considered chance outcomes.

PART FIVE

DISCUSSION OF RESULTS: EVALUATION AND IMPLICATIONS

Most research investigations, particularly those dealing with human behavior, are circumscribed by certain variables and limitations, many of which are difficult to predict or obviate. Among the possible limitations of the present study is the shortness of the speech therapy period. It is likely that a period of four months is too brief for mentally retarded children to make readily measurable improvement in a number of the attributes of communicative behavior. Should similar studies be conducted it is recommended that speech therapy be extended.

In spite of the probable limitation imposed by the shortness of the therapy period, some of the results of the present study clearly indicate support of the major hypotheses. Other results offer further clarification of the major findings and suggest other important implications. Some of these implications are discussed in this section.

San Francisco Inventory of Communicative Effectiveness (SFICE)

It was a purpose of the present study to develop a test by which relatively objective assessment of various attributes of communicative effectiveness of mentally retarded children could be made. As a result of extensive study and pilot testing, the San Francisco Inventory of Communicative Effectiveness (SFICE) was devised, whose usefulness is indicated in a number of the research findings.

Perhaps the strongest evidence of the appropriateness of SFICE in measuring communicative effectiveness is the fact that the identification and definition of attributes of communicative effectiveness was derived by the present investigators from extensive analysis of the actual communicative behavior of mentally retarded children as well as from the study of existing speech and language tests.

Further evidence of the appropriateness of the classification of communicative attributes and of the test itself is the high degree of agreement among the three judges who rated the test performance of the 90 subjects in the study (Table 7, Appendix E, page 155). On individual sub-scales the lowest median intercorrelations were found for Appropriateness, .61, and Immediacy, .64. Highest median correlations were found for Over-all Communicative Effectiveness, .89, and Average Length of Response, .82.

Particularly impressive was the fact that reliability of Over-all Communicative Effectiveness (a sub-scale of SFICE) rating was as high as that achieved for the statistical composite score (a mathematical total of sub-scales of SFICE): both have a median interjudge correlation of .89. That so global and impressionistic a judgment can be made reliably is in itself encouraging. What is even more striking is the fact that the single sub-scale rating of Over-all Communicative Effectiveness correlates almost perfectly (.94) with the mathematical composite score. (Table 22, Appendix F, pages 172-174). Not only does this correspondence point to the appropriateness of the implicit choice and weighting of cues used in making the over-all judgment, but, practically, it suggests that a single trained judge can provide valid global ratings. It should be remembered, however, that over-all ratings were made in the context of individual judgments of each of the other attributes. Therefore, if a single global rating is to be made, the judge, at the very least, should deliberately review each of the attributes before making an over-all rating.

It is also interesting to note that ratings of those attributes on SFICE which contributed most to the score of Over-all Communicative Effectiveness are the same as those perceived by a number of teachers and speech therapists who work with the mentally retarded as most significant in the child's daily communicative effectiveness. From the correlation matrix of pre-therapy scores (Table 22, Appendix F, pages 172-174) it can be seen that those attributes most highly related to Over-all Communicative Effectiveness were: Complexity of Ideation (.92, .95, .96)* Average Length of Response (.89, .90, .90), Involvement (.84, .89, .91), Appropriateness (.80, .83, .85), and Ease of Relationship (.76, .76, .82). The attributes which appeared to contribute least to the Over-all Communicative Effectiveness score were Articulatory Proficiency (46, .48, .67) and Immediacy of Response (.58, .64, .74).

Although these correlations represent relationships between the judges' rating scores, not necessarily between the actual attributes themselves, they are consistent with the convictions of some specialists in the fields of speech and mental retardation that improvement in the articulation of mentally retarded children may not be as important to their total communicative effectiveness as improvement in what they may have to say and in their desire and ability to relate comfortably to other people.

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*The three correlations are from the two experimental groups and one control group.

Articulation Profile

An important feature of communication-centered speech therapy is that practice in articulation is given under communicative learning conditions. It has been observed in work with mentally retarded and other children that improvement in articulation is more effective under these conditions than with the conventional ear-training-articulation-drill procedures. Results of the present study corroborate this clinical observation. A major finding of the study was that improvement in articulation of individual sounds and words as measured by the articulation profile was greatest among subjects who received communication-centered speech therapy.

One of the weaknesses of an ear-training-articulation-drill procedure which has been observed by speech therapists, particularly in their work with the mentally retarded, is that extensive practice in producing the sound in isolation may develop exaggerated and unsure habits of articulation. These are usually improved as the child continues to practice, but, as speech therapists have reported there is sometimes an undesirable residual of inappropriate elements of articulation carried over from the isolated sound practice phase of therapy. It is interesting to note that in the articulation test results of the present study, the children who received conventional therapy not only failed to improve in articulation of the test sounds in words, but actually obtained poorer mean scores in imitation of isolated sounds after therapy.

In articulation therapy, an ultimate goal is the correct production of speech sounds in continuous speech. This usually occurs more readily in the speech responses the child practices in therapy than in his daily conversational speech. This difficulty of carry-over of the correctly articulated sounds into the child's daily conversation has long been a major problem in speech therapy. In communication-centered speech therapy, this transfer of learning often occurs soon after the sound is practiced because of the early and continuous emphasis on carry-over conditions within the therapy itself.

In the present study, ratings of articulation of the subject's continuous speech (SFICE), as contrasted with his articulation of individual sounds and words (Articulation Profile), did not show improvement for either of the experimental groups, even though it was expected that subjects receiving communication-centered therapy would demonstrate carry-over, i.e., improvement in continuous speech. One of the reasons for this may be that, as with other attributes of the communicative effectiveness inventory, articulation improvement in continuous speech may not be demonstrated with so short a term of therapy as given in this study.

Results of the articulation profile indicate that both the educable and severely mentally retarded children made significant improvement in articulation. However, it is interesting to note that the educable mentally retarded did not make significantly greater improvement than the severely retarded, although there was an apparent trend in favor of the educable group. The inference may be made that educable mentally retarded children may profit more than the severely retarded but that both groups may benefit from speech training.

In addition to indicating the effectiveness of speech training with mentally retarded children, results of the articulation profile also suggest that such a test is an effective and useful device in measuring gains in articulatory proficiency even from a four month therapy period. Gains in articulatory skill were demonstrated on each scale of the articulation test: (a) picture naming, i.e., producing the test sound in a word without imitation of the examiner, (b) word imitation, i.e., producing the test sound in a word in imitation of the examiner, and (c) sound imitation, i.e., producing the test sound in isolation in imitation of the examiner. These findings tend to corroborate previous indications (24) of the usefulness of imitation stimulus tests.

Sound Discrimination

Results of the sound discrimination test showed no significant differences in sound discrimination ability between experimental and control subjects. Two possible explanations for this are (1) that they made no improvement in sound discrimination, and (2) that the test instrument was not sufficiently sensitive to measure adequately the sound discrimination ability of mentally retarded children. In terms of the common belief that sound discrimination is an essential and preceding ability to production of speech sounds, it would be expected that subjects of this study who showed improvement in articulation would also demonstrate improvement in sound discrimination. Since such improvement was not demonstrated, the inference may be made that lack of differential improvement is chiefly attributable to the inadequacy of the sound discrimination test used in this study.

Implications for Speech Therapists*

1. An implication which is suggested by results of the San Francisco Inventory of Communicative Effectiveness is that communicative effectiveness of mentally retarded children is dependent upon a number of attributes

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*For detailed description of communication-centered speech therapy see Part Three.

of communicative behavior, some of which, e.g., communicative initiative and complexity of ideation, may be of as great or greater importance than articulatory proficiency. To assess the communicative effectiveness of mentally retarded children, therefore, it appears necessary to evaluate a broader spectrum of communicative behavior than articulation alone. The inventory (SFICE) developed in this study is designed to help the therapist make such additional evaluations. Results of SFICE further suggest that, if mentally retarded children are to achieve communicative effectiveness, speech therapy should emphasize other attributes of communicative behavior in addition to articulatory proficiency.

2. Speech therapists who are aware of the above implication and who emphasize improvement in communicative relationships, group interaction, and the communicative context in which to practice speech sounds can take reassurance from the results of this study that these methods produce improvement in articulation as readily as, if not better than, methods of more intensive practice in speech sound production, specifically with mentally retarded children.

3. A frequent concern among speech therapists who observe communication-centered speech therapy is that the practice sound is not repeated often enough during the therapy period -- that valuable practice time is spent in encouraging group interaction and in arranging the appropriate communicative learning context at the expense of frequent repetition of the practice sound. Theoretically this can be explained as an advantage rather than a fault. In terms of a communication-centered theory of speech learning, successful communicative relationships are the matrix out of which improved articulation naturally evolves even without direct practice on the specific sound. The theory also explains that speech

sounds are learned more quickly, with greater carry-over to conversational speech, when practiced in the communicative context. This principle suggests that the richness and appropriateness of the learning context may be profitably emphasized even at the expense of more frequent repetition of the practice sound. The possibility that these theoretical advantages are actually so is suggested by the positive results of this study.

4. Another concern of speech therapists as they consider the principles of communication-centered speech therapy is that the practice sounds are not always "corrected" in isolation before being spoken in the practice word. This is likely an advantage rather than a disadvantage in speech therapy because it tends to avoid the increased anxiety which concern about the mechanics of speaking and the emphasis on correcting a mistake may arouse in children.

5. In addition, learning of the practice sound in the context of a communicative response, as compared with emphasis on producing the sound in isolation, has the important advantage of being learned in a speech response which has immediate meaning and utility in his daily speaking experiences, thus ensuring optimum carry-over.

6. Speech training should be intensive and over an extended period of time. Even though in this study statistically significant improvement in various attributes of communicative effectiveness was not demonstrated, some improvement was made in these attributes indicating that had the period of speech therapy been carried on over a longer period, it is likely that statistical significance would have been achieved.

7. Results of the study further show that speech training is profitable for the severely mentally retarded as well as the educable mentally retarded, indicating a justification for providing speech therapy

for both groups.

8. In testing the articulatory proficiency of mentally retarded children, speech therapists may use the San Francisco Articulation Profile with the assurance that these children will respond to the test items with maximum familiarity and recognizability.

Implications for Classroom Teachers

1. With respect to teaching methods in general, results support the philosophy that learning for the mentally retarded is more successful "through active participation in first hand experiences" involving "activities which evolve from real life situations" (12).

2. Classroom instruction in speech and language which integrates the teaching of communicative skills with the daily life activities of the children is also encouraged by the results of the present investigation. It is likely that the same learning principles which contributed to improvement of articulation in this study, namely, those basic to communication-centered speech therapy, are equally effective in the acquisition of various other attributes of communicative effectiveness.

3. A further implication of the results of this study is that training in communicative skills by a speech therapist, in addition to classroom training, may facilitate improvement in communicative effectiveness of mentally retarded children. It is further implied among the principles of communication-centered speech therapy that the speech therapy, classroom, and home training programs be well coordinated so that the situations in which speech is used or practiced be as much like the real life performance situation as possible.

4. Of specific usefulness to the classroom teacher is the San Francisco Inventory of Communicative Effectiveness. Whereas the

teacher, as well as the speech therapist, is interested in development of the child's total communicative effectiveness, he also may find it helpful to analyze the child's communicative behavior in terms of the various attributes defined by SFICE and to emphasize improvement of these attributes in his classroom instruction.

5. Since the classroom teacher, particularly the teacher of mentally retarded children, has the responsibility as well as the opportunity to make ongoing evaluations of the child's intellectual and social competence, he may wish to employ SFICE as an additional evaluating instrument. The relationship of Complexity of Ideation and intelligence was not analyzed in this study. However, the commonly recognized relation of verbal ability (vocabulary, sentence length, complexity, etc.) to intelligence suggests that the teacher may find SFICE, specifically the Complexity of Ideation scale, to be a useful instrument in estimating the child's intellectual ability and in obtaining additional verification of results of previous intelligence tests. It is suggested that where the teacher has made a careful and extended observation and study of the child's daily communicative behavior and finds that his ratings of Complexity of Ideation differ markedly from intelligence scores obtained from other tests there may be some question as to whether the intelligence score reported is a true measure of the child's intellectual capacity.

Classroom teachers should be reminded, however, that a low score on SFICE, specifically Complexity of Ideation, does not necessarily indicate low intellectual ability or add corroboration to previous low scores made on other tests, since lack of communicative effectiveness may be due to other factors than mental retardation.

Implications for Further Research

Results of clinical experience indicate the effectiveness of communication-centered speech therapy and suggest that all its principles and techniques are important to its effectiveness. Results of the present research investigation generally verify these clinical impressions. However, since this study was not designed to single out and test individual principles and techniques of communication-centered speech therapy, further study of this approach is indicated in which its individual features will be more thoroughly appraised. It is hoped that investigators interested in research in communication will seek to answer experimentally such questions as:

a. Does communication-centered speech therapy improve other attributes of communicative effectiveness of mentally retarded children besides articulation if administered over an extended period of time?

b. Does increased emphasis on correlating therapy and classroom programs increase the effectiveness of communication-centered speech therapy?

c. Does parent counseling which emphasizes improving the child's communicative relationships at home increase the child's articulation improvement as a result of speech therapy more than parent counseling which emphasizes the parent's working with the child on specific sounds?

d. What is the relationship between degree of improvement in social maturity and improvement in articulation?

e. Does bodily activity as an associational learning cue hasten the learning of speech sounds?

f. What is the relationship between attributes of communicative effectiveness, specifically Complexity of Ideation (SFICE), and intelligence scores?

g. How may attributes of communicative effectiveness be further defined and tested?

h. Is communication-centered speech therapy effective in the speech training of children of normal intelligence?

It is strongly believed by the present investigators that such additional research as suggested above will lend further and more conclusive support to the hypotheses of this study and will stimulate the greater use of communication-centered procedures in speech and language learning.

APPENDICES

APPENDIX A

STATE OF CALIFORNIA LAWS AND REGULATIONS PERTAINING TO EDUCATION FOR MENTALLY RETARDED CHILDREN

STATE OF CALIFORNIA LAWS AND REGULATIONS PERTAINING TO EDUCATION FOR MENTALLY RETARDED CHILDREN

"Mentally Retarded Minors" Defined

Education Code Section 6901.* "Mentally retarded minors" means all minors who because of retarded intellectual development as determined by individual psychological examination are incapable of being educated efficiently and profitably through ordinary classroom instruction.

Provisions for Education of Mentally Retarded Minors Expected to Benefit From Special Facilities (Educable Mentally Retarded)

Education Code Section 6902. The education of mentally retarded minors who are of compulsory school age and who may be expected to benefit from special educational facilities designed to make them economically useful and socially adjusted shall be provided for in the manner set forth in Sections 6901 and 6913, inclusive, and in Sections 8951 to 8956, inclusive.

Provisions for Education of Mentally Retarded Minors Not Within Provisions of Section 6902 (Severely Mentally Retarded)

Education Code Section 6903. The education of mentally retarded minors who do not come within the provisions of Section 6902, who are five or more, and less than 18 years of age, and who may be expected to benefit from special educational facilities designed to educate and train them to further their individual acceptance, social adjustment, and economic usefulness in their homes and within a sheltered environment, may be provided for in the manner set forth in Sections 6901 to 6913, inclusive, and in Sections 8951 to 8956, inclusive.

Each school district maintaining special training schools or classes for such mentally retarded minors may limit the number of minors to be admitted to such schools or classes.

Any such minor who becomes 18 years of age while in attendance upon a special training school or class shall be permitted to continue to attend thereon for the remainder of the time such school or class is maintained during the then current school year.

From the effective date of the 1957 amendment to this section, until the end of the 1961-1962 school year, this section shall also apply to the education of mentally retarded minors who are five or more, and less than 21 years of age, and who meet the other requirements of this section.

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* Education Code, State of California, 1959.

Mentally Retarded Minors Coming Within the Provisions of Education Code Section 6902 (Educable)

180.* Establishment of Special Training Schools and Classes; Minors 8-18. Special training schools and special training classes for the education of mentally retarded minors between the ages of 8 and 18 years who come within the provisions of Education Code Section 6902 shall be established by governing boards of elementary school districts and unified school districts and by county superintendents of schools, and may be established by governing boards of high school districts, pursuant to Chapter 9 of Division 6 of the Education Code and this article.

181. Establishment of Special Training Schools and Classes; Minors Under 8. Special training schools and special training classes for mentally retarded minors who are less than eight years of age but who come within the provisions of Education Code Section 6902 pursuant to Education Code Sections 5801 and 8951, be established by the governing board of any elementary school district or unified school district or by a county superintendent of schools.

182. Eligibility of Pupils. The eligibility of a minor for admission to any such school or class shall be determined by a psychologist or psychometrist after such pupil has been given an accepted verbal or non-verbal individual intelligence test. For minors of an appropriate age, group intelligence tests may be used as screening devices.

183. Admission. The responsibility for the assignment of a minor to any such school or class maintained by a school district shall rest with the administrative head of the school district or an employee of the district designated by him. The assignment of a minor shall be made only after a group conference of the psychologist, the school principal, the minor's teacher, the school physician or nurse, if any, and any other person designated by the person responsible for making such assignment.

184. Size of Class. The maximum enrollment for any such class shall be 18, except that in a class in which the chronological age spread is greater than four years, the maximum enrollment shall be 15.

Mentally Retarded Minors Coming Within the Provisions of Education Code Section 6903 (Severe)

196. Establishment of Special Training Schools and Classes. Special training schools and special training classes for the education and training of mentally retarded minors who come within the provisions of Education Code Section 6903 may be established by the governing boards of elementary, high school, or unified school districts and by county superintendents of schools pursuant to Chapter 9 of Division 6

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* California Administrative Code. Title 5. Education. Special Edition distributed by the California State Department of Education, Sacramento July, 1954. Amended March 14, 1960.

of the Education Code and this article.

197. Eligibility of Pupils. The eligibility of a minor for admission to any such school or class shall be determined by properly certificated and qualified psychological and medical examiners. The following criteria shall serve as minimum eligibility requirements:

(a) General. A child must not come within the provisions of Education Code Section 6902.

(b) Physical Condition. A child must: (1) Be able to hear spoken connected language and be able to see well enough to engage in special class activities without undue risk; (2) Be ambulatory to the extent that no undue risk to himself or hazard to others is involved in his daily work and play activities; (3) Be trained in toilet habits so that he has control over his body functions to the extent that it is feasible to keep him in school.

(c) Mental, Emotional, and Social Development. A child must: (1) Be able to communicate to the extent that he can make his wants known and to understand simple directions; (2) Be developed socially to the extent that his behavior does not endanger himself and the physical well being of other members of the group; (3) Be emotionally stable to the extent that group stimulation will not intensify his problems unduly, that he can react to learning situations, and that his presence is not inimical to the welfare of other children.

198. Admission. The responsibility for the assignment of a minor to a special school or class maintained by a school district shall rest with the administrative head of the school district or an employee of the district designated by him. The assignment of a minor to or continuation in a special class shall be made upon the recommendation of an admissions committee, composed of the school psychologist, the school physician and/or nurse, the minor's teacher, and any other professional person designated by the person responsible for making such assignment. The assignment of minors may be conditional, subject to review by the admissions committee. In cases where doubt exists, a child should be given a trial placement.

199. Size of Class. The maximum enrollment for any such class shall be 12 pupils per teacher.

199.2. Grade Placement. Pupils in such schools and classes shall be grouped on a basis of social competence rather than by grade level.

Individual Examination of Child by Psychologist

Education Code Section 6908. Before any child is placed in a school or class for mentally retarded children, he shall be given a careful individual examination by a competent psychologist holding a credential for that purpose issued by the State Board of Education, and a consultation with his parents or guardian held. A psychiatrist may be consulted in any specific case when the governing board of the district deems it necessary.

APPENDIX B

SUBJECT INFORMATION

Composition of experimental and control groups: Tables 3, 4, 5

Composition of therapy groups in experimental sample: Table 6

TABLE 3

SUBJECT DATA
Conventional Therapy Experimental Subjects
Group E_1

Subject No.	Sex	C.A. Months	M.A. Months	IQ	Test*	Class
1	F	121	48	40	SB(L)	Severe
2	M	127	57	45	SB(L)	Severe
3	F	101	48	47	SB(L)	Severe
4	M	151	74	49	SB(L)	Severe
5	M	130	61	47	SB(L)	Severe
6	F	115	53	46	SB(L)	Severe
7	M	169	69	41	SB(L)	Severe
8	M	144	66	46	SB(L)	Severe
9	F	145	61	42	SB(L)	Severe
10**	M	142	64	45	SB(L)	Severe
11	F	166	98	59	SB(L)	Severe
12	F	172	84	49	SB(L)	Severe
13	M	170	71	42	SB(L)	Severe
14	F	99	47	47	SB(L)	Severe
15	M	122	67	55	SB(L)	Severe
16	M	134	58	43	SB(L)	Severe
17	M	126	66	52	SB(L)	Severe
18	M	126	83	66	SB(L)	Educable
19	M	141	83	59	SB(L)	Educable
20	M	150	92	61	SB(L)	Educable
21	M	124	87	70	SB(L)	Educable
22	F	108	62	57	SB(L)	Educable
23	F	134	75	56	SB(L)	Educable
24	M	120	89	74	SB(L)	Educable
25	M	120	71	59	SB(L)	Educable
26	M	131	93	71	SB(L)	Educable

* SB(L) refers to Stanford Binet Form L.

** Subjects who were finally dropped from study because of incompleteness of data.

TABLE 4

SUBJECT DATA
Communication-Centered Therapy Experimental Subjects
Group E_2

Subject No.	Sex	C.A. Months	M.A. Months	IQ	Test*	Class
1	M	116	89	77	SB(L)	Educable
2	M	131	83	63	SB(L)	Educable
3	M	143	96	67	SB(L)	Educable
4	M	118	66	56	WISC	Educable
5	F	154	99	64	WISC	Educable
6	F	87	57	65	WISC	Educable
7	M	123	69	56	WISC	Educable
8	M	136	76	56	WISC	Educable
9	M	117	91	78	SB(L)	Educable
10	M	124	91	73	WISC	Educable
11	F	120	80	67	WISC	Educable
12	M	142	99	70	WISC	Educable
13	M	154	71	46	WISC	Educable
14	M	150	93	62	WISC	Educable
15	M	170	68	40	SB(L)	Severe
16	M	112	53	47	WISC	Educable
17	M	120	71	59	WISC	Educable
18	M	110	71	65	SB(L)	Educable
19	M	109	52	48	WISC	Educable
20	F	115	52	45	SB(L)	Severe
21	M	118	56	47	SB(L)	Severe
22	M	93	47	50	SB(L)	Severe
23	M	148	76	51	SB(L)	Severe
24	M	112	56	50	SB(L)	Severe
25	M	148	59	40	SB(L)	Severe
26	F	133	48	50	SB(L)	Severe
27**	F	110	50	45	SB(L)	Severe
28	M	180	74	41	SB(L)	Severe
29	F	121	70	58	SB(L)	Severe
30	F	141	66	47	WISC	Severe

* SB(L) refers to Stanford Binet Form L.
WISC refers to Wechsler Intelligence Scale for Children

** Subjects who were finally dropped from study because of incompleteness of data.

TABLE 5

SUBJECT DATA
Control Subjects (Non-Therapy)
Group C

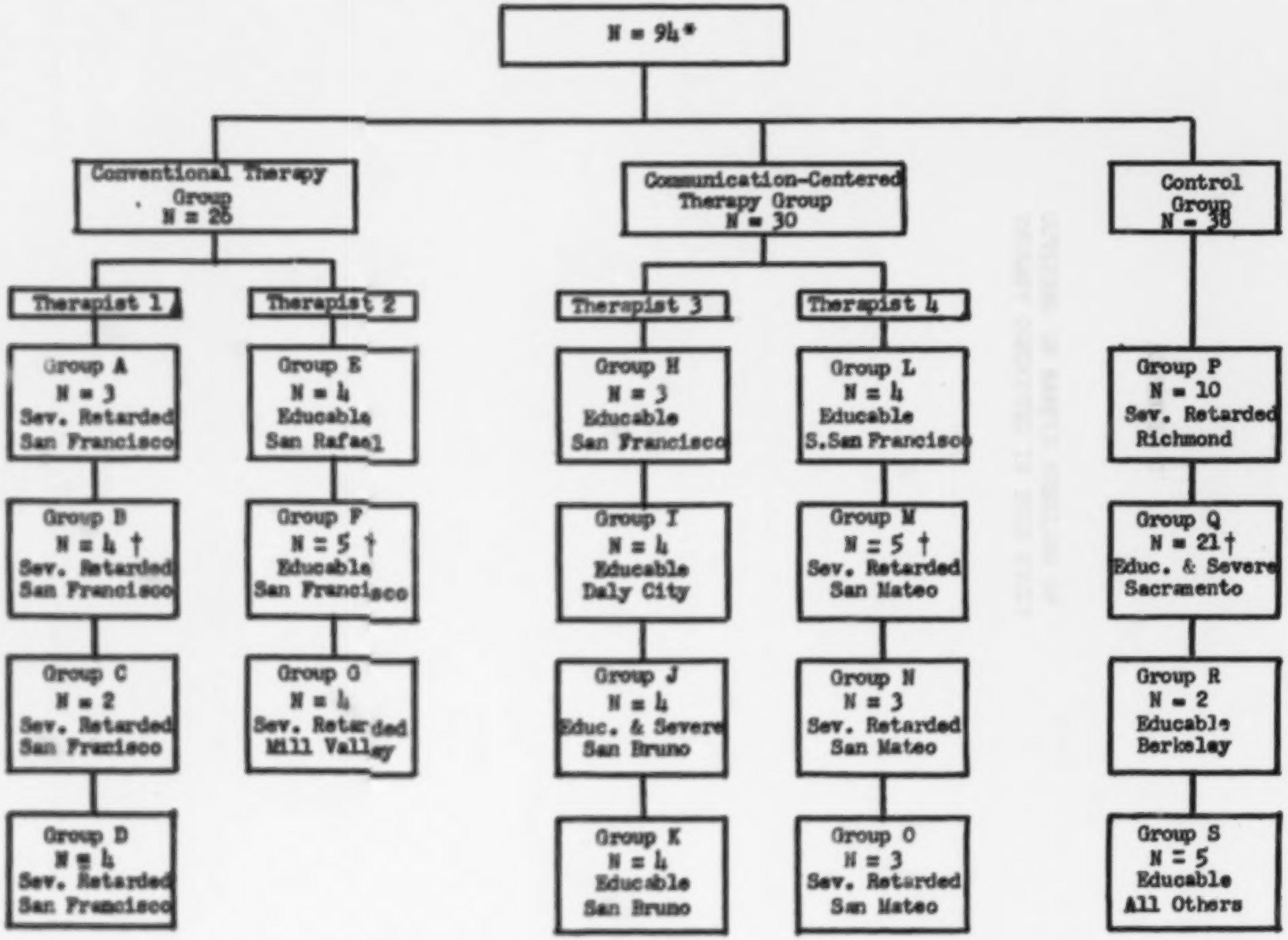
Subject No.	Sex	C.A. Months	M.A. Months	IQ	Test*	Class
1	F	83	50	60	SB(L)	Educable
2	F	154	100	65	SB(L)	Educable
3	M	94	71	75	SB(L)	Educable
4	M	86	58	67	SB(L)	Educable
5	F	165	92	56	WISC	Educable
6	F	92	51	56	SB(L)	Educable
7	M	106	71	67	SB(L)	Educable
8	M	171	79	46	SB(L)	Severe
9**	M	106	68	64	Amm.	Severe
10	M	104	52	50	SB(L)	Severe
11	M	121	54	45	Leit.	Severe
12	F	162	75	46	SB(L)	Severe
13	F	161	76	47	SB(L)	Severe
14	M	105	47	45	SB(L)	Severe
15	M	137	75	55	SB(M)	Severe
16	M	121	62	52	SB(L)	Severe
17	M	133	65	49	SB(L)	Severe
18	F	155	99	64	SB(L)	Educable
19	F	130	79	61	SB(M)	Educable
20	M	140	105	75	SB(L)	Educable
21	M	116	77	66	SB(M)	Educable
22	F	110	80	73	SB(L)	Educable
23	F	95	66	70	SB(L)	Educable
24	M	117	69	59	SB(L)	Severe
25	M	92	48	52	SB(L)	Severe
26	F	111	54	49	SB(L)	Severe
27	F	175	91	52	SB(M)	Severe
28	F	158	69	44	Good.	Severe
29	M	163	68	42	SB(L)	Severe
30	M	144	62	43	SB(M)	Severe
31	M	136	72	53	SB(L)	Severe
32	M	87	52	60	SB(M)	Severe
33	F	111	49	44	SB(L)	Severe
34	M	85	36	43	SB(L)	Severe
35	M	109	56	51	SB(L)	Severe
36	M	124	50	40	SB(L)	Severe
37	M	91	66	72	SB(L)	Educable
38	F	117	80	68	WISC	Educable

* SB(L) refers to Stanford Binet Form L.
SB(M) refers to Stanford Binet Form M.
WISC refers to Wechsler Intelligence Scale for Children.
Amm. refers to The Full-Range Picture Vocabulary Test.
Leit. refers to The Leiter International Performance Scale.
Good. refers to Goodenough's Minnesota Preschool Scale.

** Subjects who were finally dropped from study because of incompleteness of data.

TABLE 6

COMPOSITION OF THERAPY GROUPS IN EXPERIMENTAL SAMPLE


N = 94*
Conventional Therapy Group N = 26
Communication-Centered Therapy Group N = 30
Control Group N = 38
Therapist 1
Therapist 2
Therapist 3
Therapist 4
Group A N = 3 Sev. Retarded San Francisco
Group B N = 4 † Sev. Retarded San Francisco
Group C N = 2 Sev. Retarded San Franisco
Group D N = 4 Sev. Retarded San Francisco
Group E N = 4 Educable San Rafael
Group F N = 5 † Educable San Francisco
Group G N = 4 Sev. Retarded Mill Valley
Group H N = 3 Educable San Francisco
Group I N = 4 Educable Daly City
Group J N = 4 Educ. & Severe San Bruno
Group K N = 4 Educable San Bruno
Group L N = 4 Educable S.San Francisco
Group M N = 5 † Sev. Retarded San Mateo
Group N N = 3 Sev. Retarded San Mateo
Group O N = 3 Sev. Retarded San Mateo
Group P N = 10 Sev. Retarded Richmond
Group Q N = 21† Educ. & Severe Sacramento
Group R N = 2 Educable Berkeley
Group S N = 5 Educable All Others

*All 94 subjects received therapy. However, four subjects[†] were later disqualified because of incomplete data.

APPENDIX C

OUTLINES OF SAMPLE SESSIONS OF THERAPY CONDUCTED IN THIS STUDY

OUTLINES OF SAMPLE SESSIONS OF THERAPY CONDUCTED IN THIS STUDY*

Communication-Centered Speech Therapy

Sample 1.

Objectives:

Adjustive: (a) To arrange activities which will permit children to demonstrate their manner of adjusting to communicative situations.

(b) To begin group unification and participation of all group members.

Speech: (a) To encourage verbal communicative behavior.

(b) Specific practice of "Hello."

Materials: Play figures of children; doll house with furniture and play figures; wooden train and tracks.

Procedure: (a) Greetings - Therapist encourages and gives practice in "Hello" through child-to-therapist and child-to-child interaction. Also sharing of recent experiences or telling about something child may have brought to therapy session. Children are encouraged to talk in the sharing period without practice on specific speech responses or sounds.

(b) Rehearsal - Story is related by therapist and illustrated with play figures about child who is lonesome. Playing alone, he is still lonesome. Asking each of several other children if he may play with them and sharing his toy with each of them, he has fun and is no longer lonesome. Children may take play figure and show how it joins other play figure while therapist tells story again.

(c) Activity - Doll house is set up and one child plays with dolls and furniture. Children are asked who else would like a turn. Next child joins first child at doll house. Both children are commended for sharing. Third child joins other two, with prompting if necessary.

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* Lesson outlines are included here at the risk of possible misrepresentation of the process of actual therapy. These outlines cannot indicate the subtle and continuous dynamics, group interaction, spontaneity and responsiveness, etc., which are essential to the therapy process and the conducting of therapy. For further description of these approaches see Part Three, page 57.

Other cooperative activities are introduced, such as wooden train and tracks to provide opportunity for more varied communicative interaction.

Observation is made as to tendency of children to play alone, play aggressively, withdraw from any activity, etc.

Sample 2.

Objectives:

Adjustive: To emphasize group unification and individual participation.

Speech: (a) To encourage verbal communication.

(b) Specific practice of "yes."

Materials: Toys, such as pound-a-peg, pump ball, puzzles, clay, crayons, and paper, etc.

Procedure: (a) Greetings - Usual routine with opportunity for children to talk at length about things that interest them.

(b) Rehearsal - Brief story in which child obtains a toy from the teacher and from other children by saying "Yes" when he is asked, "Do you want the ________?" "Yes" response is practiced as it appears in the story several times. The whole word is spoken by each child or a non-verbal indication of "Yes" is accepted.

Before the Activity there is a brief demonstration of how toys or other things are obtained from therapist or other child by saying "Yes" when asked "Do you want _____?"

(c) Activity - Variety of toys are brought to room or taken from box. Therapist asks a child if he wants to pump ball. Child says "Yes.", or even indicates "Yes" with non-verbal behavior. Therapist commends child for saying "Yes." Toys are distributed by therapist or other child by asking if each child wants toy. Therapist encourages cooperative play rather than parallel play and stimulates conversation about the activity.

Sample 3.

Objectives:

Adjustive: To continue encouraging group unification, individual participation, taking turns.

Speech: (a) To encourage verbal communication.

(b) To practice specific speech responses which have communicative power, such as "stop" and "go."

Materials: Toy telephones, colored stop and go signs, stop watch.

Procedure: (a) Greetings - Usual routine, also use of toy telephone in saying "Hello" to other children.

(b) Rehearsal - Brief story and demonstration of how policeman stops traffic by saying, "stop" and holding up stop sign and lets it go again by saying "go" as he lovers stop sign or holds up go sign. Each response is practiced by the children as the story is told.

Demonstration of use of response is done using one or two children and actual stop-go signs. If child is reluctant to say "stop" and "go," just holding the sign is accepted.

(c) Activity - Children take turns being the policeman while other children individually are stopped and let go. Other application of stop may be made in having someone tell something to group, draw a picture, or let a stop watch run until child says "Stop." Comments and discussion about the activity are encouraged.

Sample 4.

Objectives:

Adjustive: To continue encouraging group participation, sharing, asking and taking turns.

Speech: (a) To encourage verbal communication.

(b) To practice specific speech responses "May I see?" and "Yes."

(c) To practice specific speech sound "s" within practice speech response.

Materials: Pictures of postman and mailbox, fireman and fire engine, store clerk and cash register, boy with picture. Viewers with pictures. Other May-I-see toys such as kaleidescope, picture book, etc.

Procedure: (a) Greetings - Usual routine - "Hello" may be practiced by having children come in door one at a time while first child greets newcomers.

(b) Rehearsal - Story is told of child who wants to see what postman is taking from large mailbox. When he says, "May I see," postman says "Yes." Then he wants to see the fire engine in the firehouse. When he asks "May I see?" the fireman says, "Yes." When he asks the storeman, "May I see?" the storeman says, "Yes," and shows him money in the cash register. Then he comes to the neighbor boy who has a picture viewer when he asks, "May I see?" the boy says, "Yes" and lets him look at the viewer. Each time the responses, "May I see?" and "Yes," come up in the story, the children are encouraged to make the response along with or instead of the therapist. As the story continues, the words see and yes are practiced individually and then the sound "s" is practiced in isolation, with ear training, mirror work, tongue placement, etc. as needed. Additional sound practice may be given before the activity.

(c) Activity - Several viewers are made available to the children as the children say, "May I see?" to the therapist, who answers "Yes." One less viewer than the number of children is introduced so that the need to ask others, "May I see?" is always present. The therapist encourages use of "May I see?" and "Yes" by participating with the children and frequently commending them. Occasional "s" practice may be appropriate within the speech responses made during this activity as the children continue to ask "May I see?" and to describe or comment about the things they see. Spontaneity is important, however, and should not be destroyed by excessive formal speech practice. Most specific speech practice is confined to the rehearsal period.

Other May-I-see toys may be introduced for further interest.

Conventional Speech Therapy

Sample 1.

Objectives: (1) Improvement of gross speech sound discrimination. (2) Improvement of auditory discrimination of initial (s).

Materials: Play money; picture cards with (s) in initial position and some whose names rhyme with the (s) cards, e.g., soap - rope; game markers; game with path for markers.

Procedure: (1) Therapist produces a number of sounds in isolation. When child correctly identifies (s) he is given play money.

(2) Therapist names picture cards. Whenever child correctly identifies the picture he may move a marker on the game board. Therapist then uses only the (s) picture cards and in naming them may substitute other sounds for (s) including a defective (s). If child correctly identifies the (s) sound, he may move marker on the game board. This same sound discrimination practice may be used further in identifying (s) in sentences.

Sample 2.

Objectives: Awareness and identification of position of sounds within words using visual and auditory cues.

Materials: Slotted board (for initial, medial and final positions); picture cards containing (s) with name of each printed on each card; therapy sound to be underlined on some cards but not on others.

Procedure: (1) Child to sort cards as to initial, medial or final position by putting card in correct slot as each word is spoken by therapist.

(2) Each child to tell the position of a sound within a word upon hearing the word spoken by the therapist.

Sample 3.

Objectives: To develop an awareness of the frequency with which certain sounds occur in speech and self-awareness of how these sounds are distorted in his (the child's) own speech.

Materials: Reading material on elementary comprehension level; tape recorder.

Procedure: (1) Assign each child a specific sound to listen for (a sound which that specific child is producing incorrectly). Therapist names the sound for each and describes visible cues in production. Therapist then reads a passage slowly, each child keeping a tally of the frequency of occurrence of his own sound.

(2) Each child tape records a short period of spontaneous speech plus repetition of words after the therapist; on playback comparison is made between therapist and child production of the word.

Sample 4.

Objectives: To give practice in correct sound production and emphasize appropriate visual and kinesthetic cues.

Materials: Hand mirrors; small toy object.

Procedure: (1) Mirror work on sound production using sound that is commonly misarticulated by all children in group; each child to tell whether the other said the sound correctly; may be extended to production in simple words.

(2) Hide the "thimble" - small toy object is hidden by child in room while one of other children (It) is out of room. When It looks for the toy, the other children produce practice sound, such as (s), in isolation whenever It moves toward the hidden object. Hand mirror is used occasionally to reinforce the correct sound production.

Sample 5.

Objectives: To incorporate use of initial (θ) into structured responses.

Materials: Mirror; initial θ picture cards.

Procedure: (1) Each child chooses picture cards from the pack and names picture; mirror is used on speech production of this isolated word;
(2) Spelling Bee game: children stand in line, therapist asks question requiring response of (θ) word, e.g., "What is this part of the hand called?" "Thumb." When child makes an error in production of practice sound he must go to the end of the line. "Thank you," is required each time therapist hands child a picture card.

Sample 6.

Objectives: To strengthen habits of correct sound production in word and sentence context.

Materials: Game with markers.

Procedure: (1) Speed drill, three words in each series which is repeated as rapidly as possible after the therapist, ease of production of the sound in question determining the child's speed; words in each series to incorporate the therapy sound.

(2) Each child is given a marker for the pathway game; one space is advanced for each correct production of a therapy word in a sentence.

Sample 7.

Objectives: To promote carry-over of correct sound production into spontaneous speech.

Materials: Toy cash register; pictures of groceries, vegetables, etc., in which therapy sound occurs; animal cards.

Procedure: (1) Each child received turn to shop at the store (which is operated by another child) requesting items with "I want some ______". He does not receive the item unless the practice sound in the item name was correctly pronounced (as determined by the proprietor).

(2) Five animal cards turned upside down on table; each to guess which is the big black bear (for s practice) with "I guess it's this one."

APPENDIX D

TEST FORMS AND PROCEDURES

SAN FRANCISCO
INVENTORY OF COMMUNICATIVE EFFECTIVENESS

SFICE

The San Francisco Inventory of Communicative Effectiveness is designed to evaluate a broad range of communicative attributes, some of which are not usually assessed by speech evaluating instruments. The child's performance on SFICE is evaluated by the use of two scales:

A. The Communicative Attributes Rating Scale (page 129)

B. The Verbal Output Scale (page 132)

All responses made by the subject to the examiner are tape-recorded for subsequent analysis and evaluation.

It is recommended that the examiner administer SFICE to a sufficient number of subjects to gain ease, familiarity and accuracy in administration of the test.

SFICE
INSTRUCTIONS AND TEST

Section I - Greetings

This part of the test was designed to initiate a communicative relationship between child and examiner through a common social greeting and to test the child's ability to make the appropriate social responses.

The examiner begins the test by having the child seated at a table. The examiner then comes to the table, bringing his test materials and proceeds as follows: (If the child has made no verbal response to the examiner's comment, the examiner should proceed to the next comment after a five-second pause.)

A. Ex: Hello (Pause) (Repeat if no verbal response).

B. Ex: How are you today? (Pause) (Repeat if no verbal response).

C. Ex: My name is _______. (Pause)

D. Ex: (If no response to C) What is your name? (Pause)

Section II - House and Family

This test section was designed to evoke conversational speech about a familiar topic. Several opportunities for responding on the same topic are provided.

A. Where do you live____________? (Pause)

B. Tell me about your house and family. (Pause)

C. I know a boy and girl who live in a house that has a kitchen, a living room, a bedroom. They live there with their mother and daddy, and brothers and sisters. (Pause)

Tell me more about your house and who lives in it. (Pause)

D. Present House and Family Picture Page 116 (Picture A)

Look, (child's name). Here's a house. Here is a living room where the children watch television. Here is the kitchen where mother cooks. Father is cutting the grass. Mother is holding the baby. And the children are playing ball.

Tell me more about your house and what you do there. (Pause)

Section III - Situational Pictures

These colored pictures present a simple situation familiar to the child and often evoke verbal responses which may not otherwise be easily or spontaneously elicited. Each picture represents a simple story affording opportunity for responses at various levels of complexity of ideation.

Birthday Picture Page 117 (Picture B)

A. I'm going to show you a picture. Tell me a story about it. (Pause)

B. Tell me more about it. (Pause)

C. Tell me more. (Pause)

Classroom Picture Page 118 (Picture C)

A. Let's look at another picture. Tell me what's happening in this picture. (Pause)

(If child does not comment on what the boys are doing, examiner will then ask:)

B. What are the boys doing? (Pause)

(If child does not state that the boys are fighting, examiner may give following cue:)

C. I think they're fighting.

D. Why are they fighting? (Pause)

E. Tell me more about why they're fighting. (Pause)

F. Tell me more. (Pause)

G. What will the teacher do with the boys who are fighting? (Pause)

H. Tell me more about what the teacher will do with the boys. (Pause)

I. Tell me more. (Pause)

Section IV - Story "Surprise"

Because of the well known power of a story to motivate interest and elicit verbal response, this section consists of a story to be told by the examiner, accompanied by appropriate pictures. As each picture is shown, the examiner reads the related story material (see page 119). At the conclusion of the story the examiner asks the following questions as he again shows each picture with an appropriate pause for the child's response:

Picture 1

1. Now (child's name), you tell me the story that I just read to you. Tell me what happened at the beginning of the story.

2. And then what happened?

Picture 2

3. Tell me about the place where they lived.

4. What kind of animals did they have on the farm?

Picture 3

5. What was it that the children wanted more than anything else?

6. Why did their mother and father say they could not have a dog or cat?

Picture 4

7. Tell me about the little girl's birthday.

8. What did the little girl get for her birthday?

Picture 5

9. Tell me about the little boy's birthday.

10. What did the little boy get for his birthday?

Picture 6

11. Were Mary and Paul happy at Christmas? Why?

Picture 7

12. What Christmas surprise did Mary and Paul find in the kitchen?

Picture 8

13. Tell me about the dog.

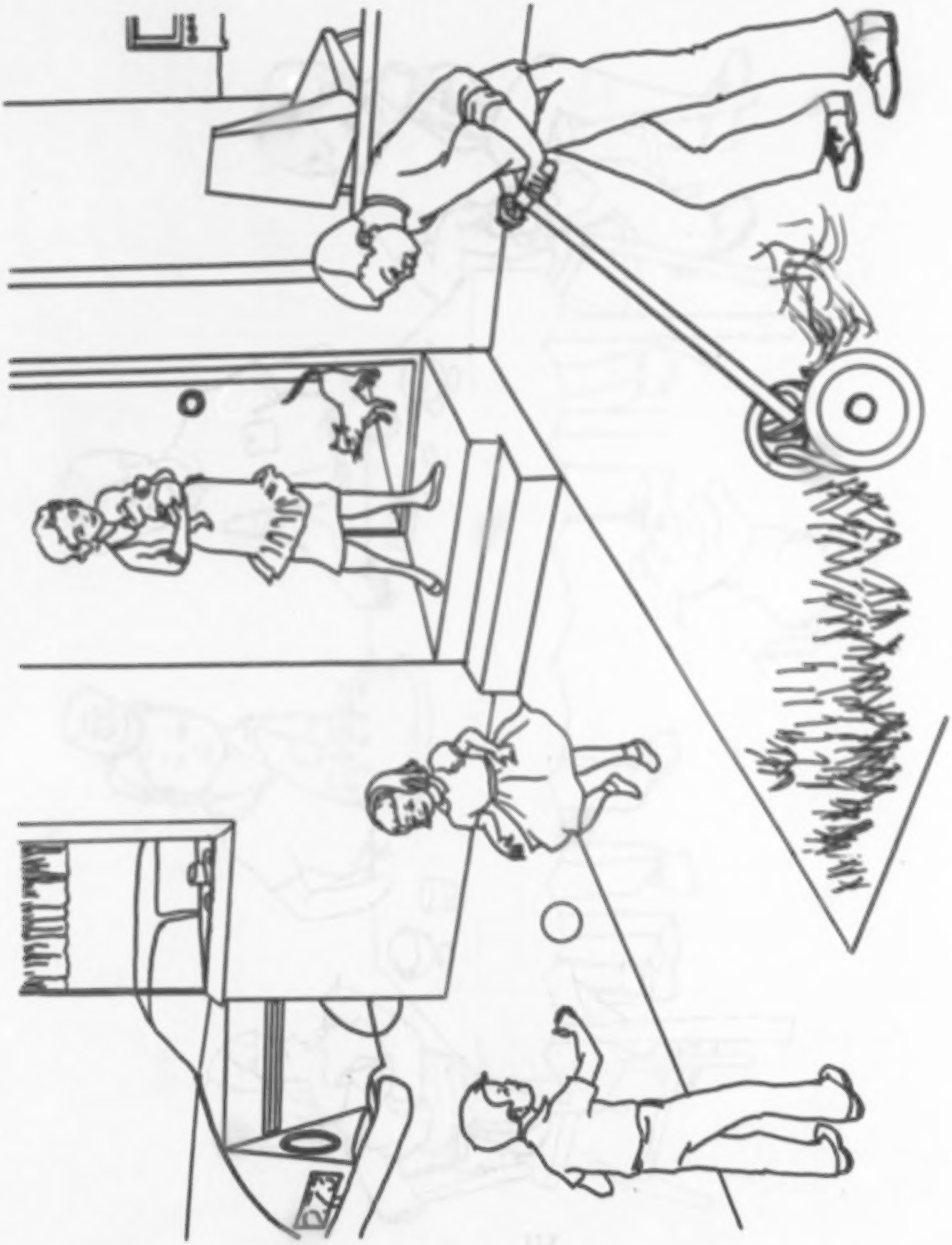
14. Tell me about the cat.

Picture 9

15. Tell me what happened at the end of the story?

16. Were the cat and dog good friends?

17. How do you know?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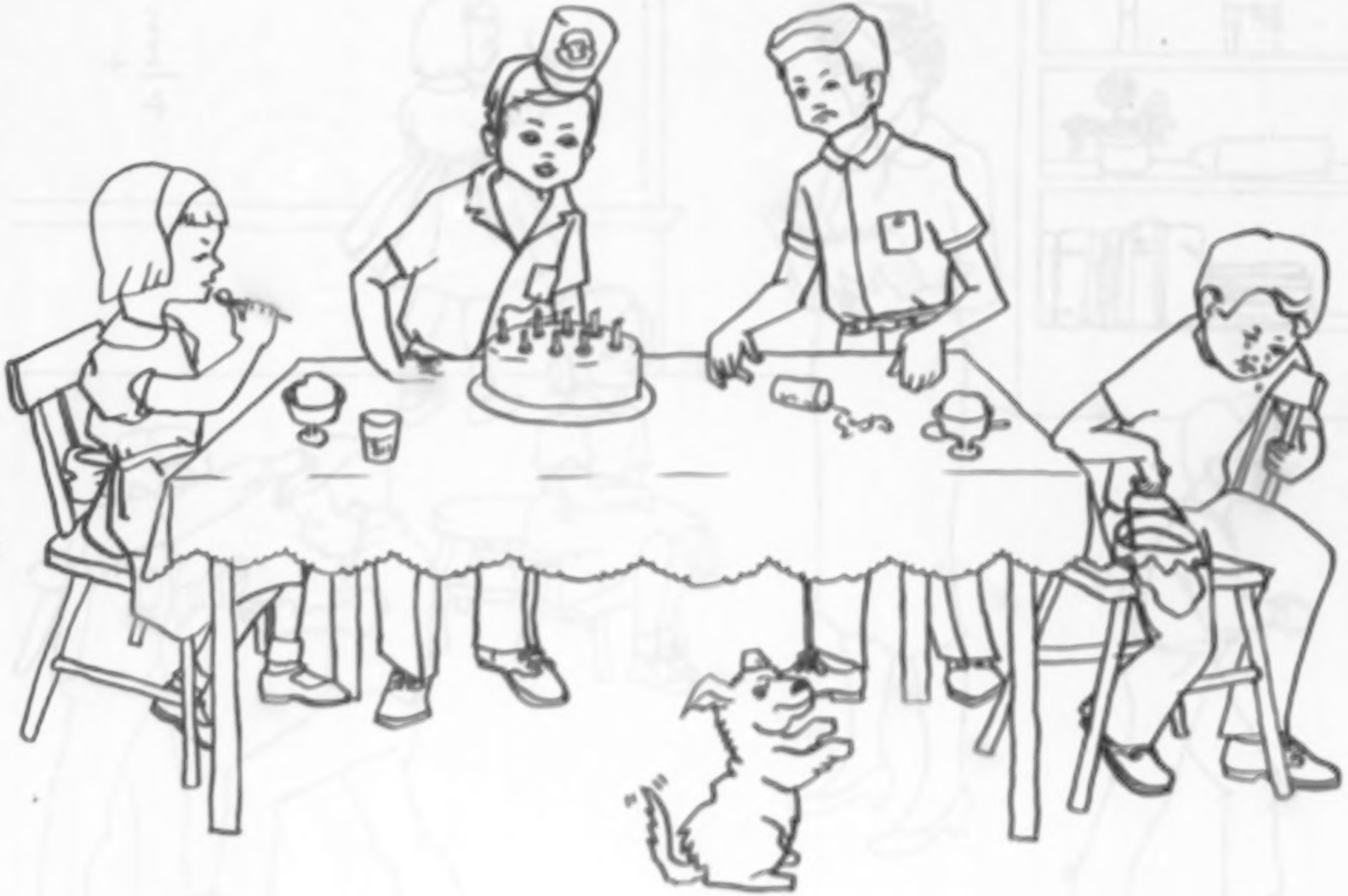

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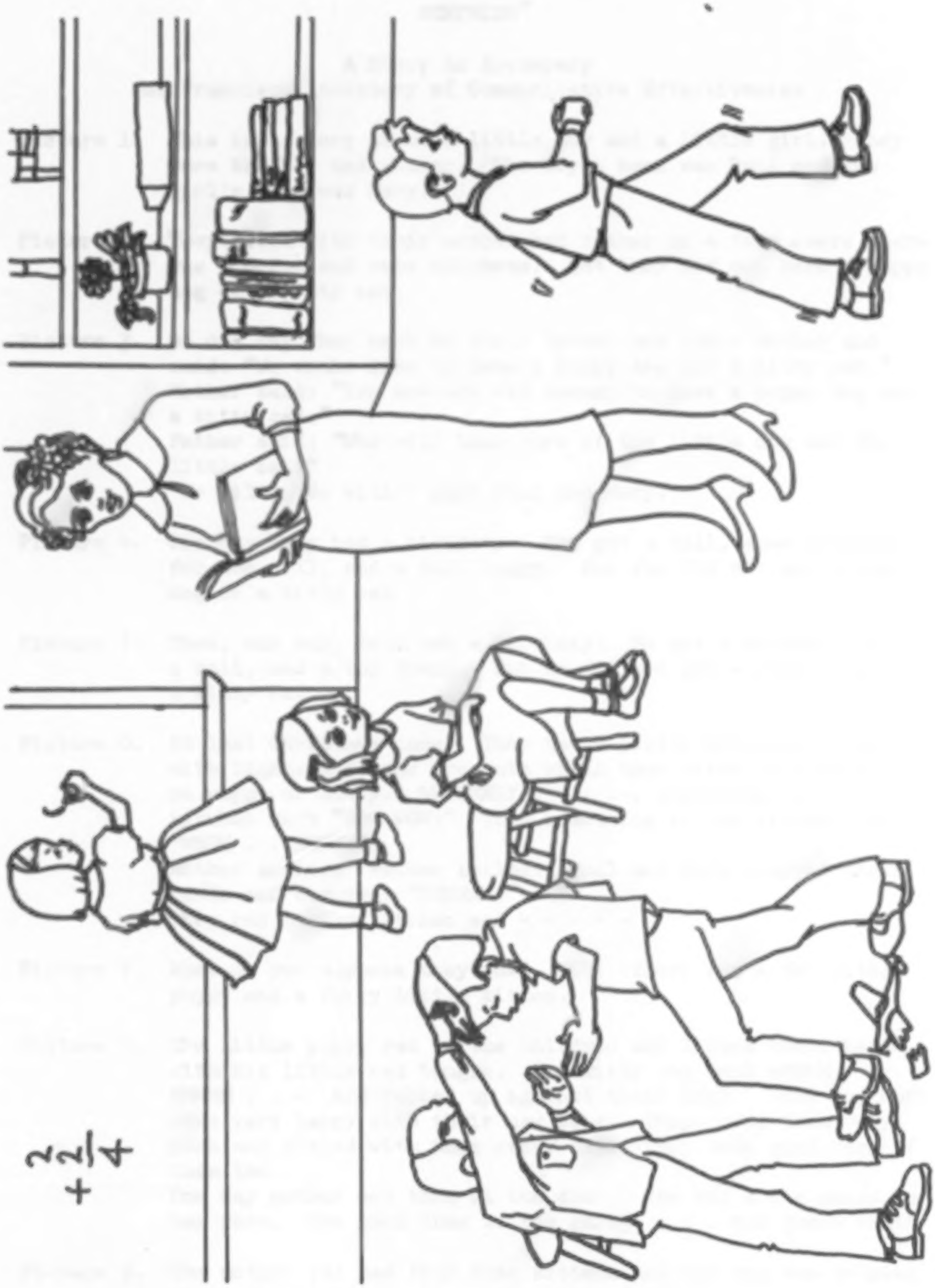

C

SURPRISE*

A Story to Accompany
San Francisco Inventory of Communicative Effectiveness

Picture 1. This is a story about a little boy and a little girl. They were brother and sister. The boy's name was Paul and the girl's name was Mary.

Picture 2. They lived with their mother and father on a farm where there was a horse and some chickens. But they did not have a puppy dog or a kitty cat.

Picture 3. So one day they went to their father and their mother and said: "We would like to have a puppy dog and a kitty cat."
Mother said: "You are not old enough to have a puppy dog and a kitty cat."
Father said: "Who will take care of the little dog and the little cat?"
"We will! We will!" said Paul and Mary.

Picture 4. One day Mary had a birthday. She got a doll, some dresses for the doll, and a doll buggy. But she did not get a puppy dog or a kitty cat.

Picture 5. Then, one day, Paul had a birthday. He got a baseball bat, a ball, and a toy train. But he did not get a puppy dog or a kitty cat.

Picture 6. At last Christmas came. They had a pretty Christmas tree with lights and some presents which they liked very much but no puppy or kitty. SUDDENLY . . . . . something in the kitchen went "BOW WOW!" Then something in the kitchen went "MEOW . . MEOW!"
Mother smiled. Father smiled. Paul and Mary clapped their hands and shouted, "HURRAY!"
They ran to the kitchen and - - - - -

Picture 7. What do you suppose they saw? YES! There was a fat little puppy and a furry little kitten.

Picture 8. The little puppy ran to the children and licked their hands with his little red tongue. The kitty cat went MMMMM . . . MMMMM . . . and rubbed up against their legs. Paul and Mary were very happy with their new pets. They loved them very much and played with them every day. They took good care of them too.
One day mother met them at the door. She had a big smile on her face. She took them to the garage . . . and guess what?

Picture 9. The mother cat had four cute kittens and the dog was helping the mother cat wash them with his red tongue.

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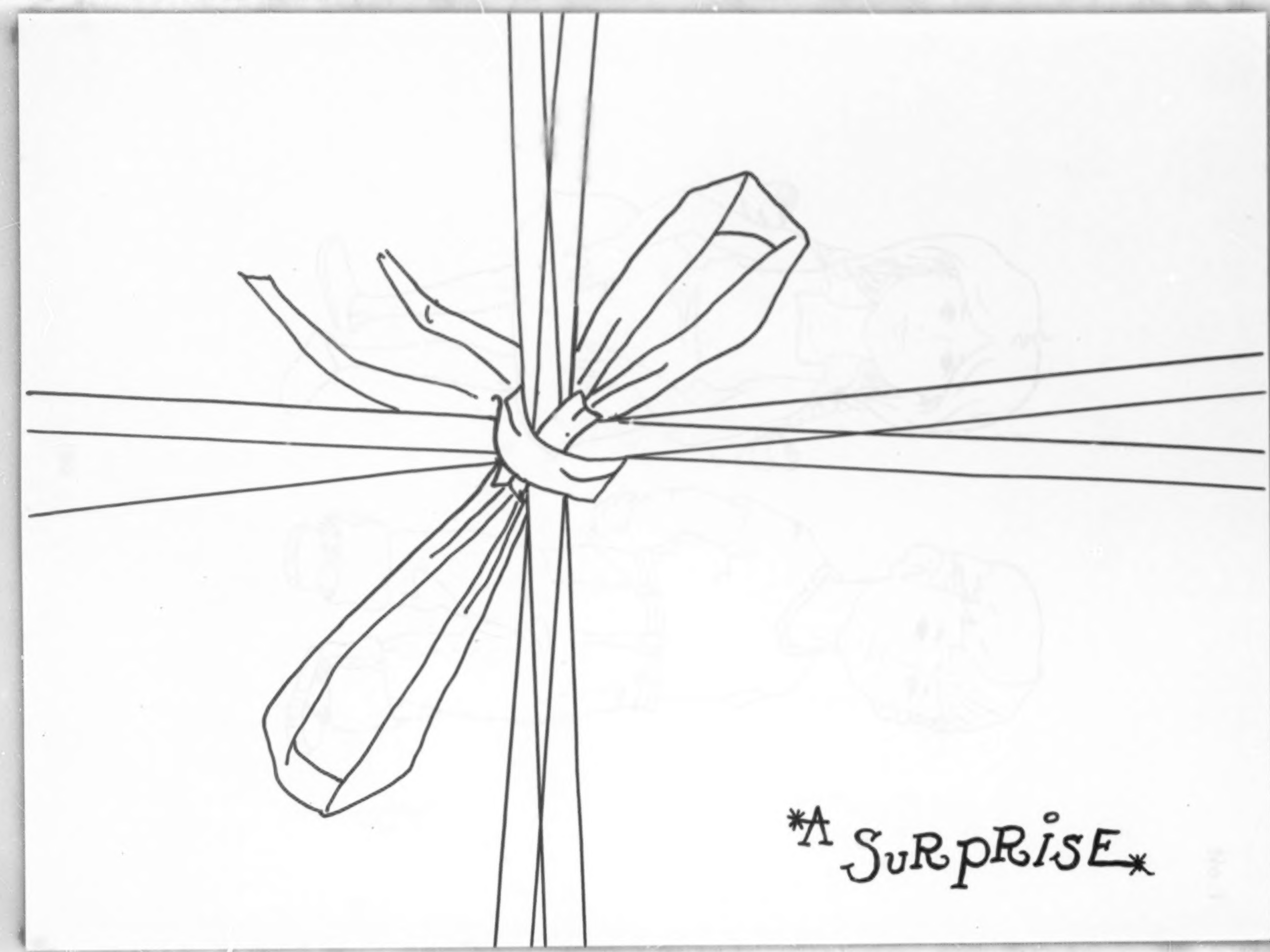
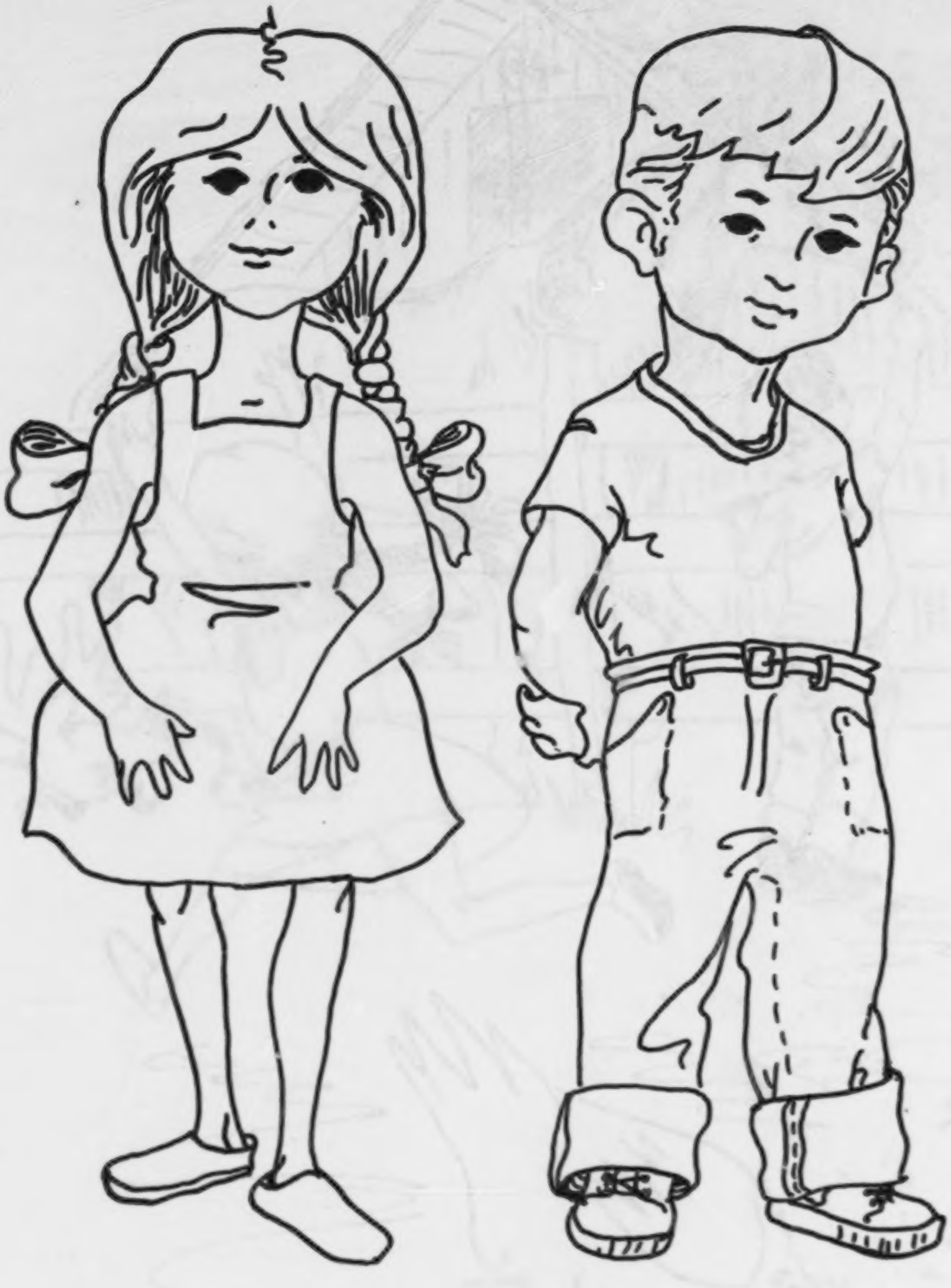
*This story held the interest of older as well as younger subjects.


A SURPRISE

No.1



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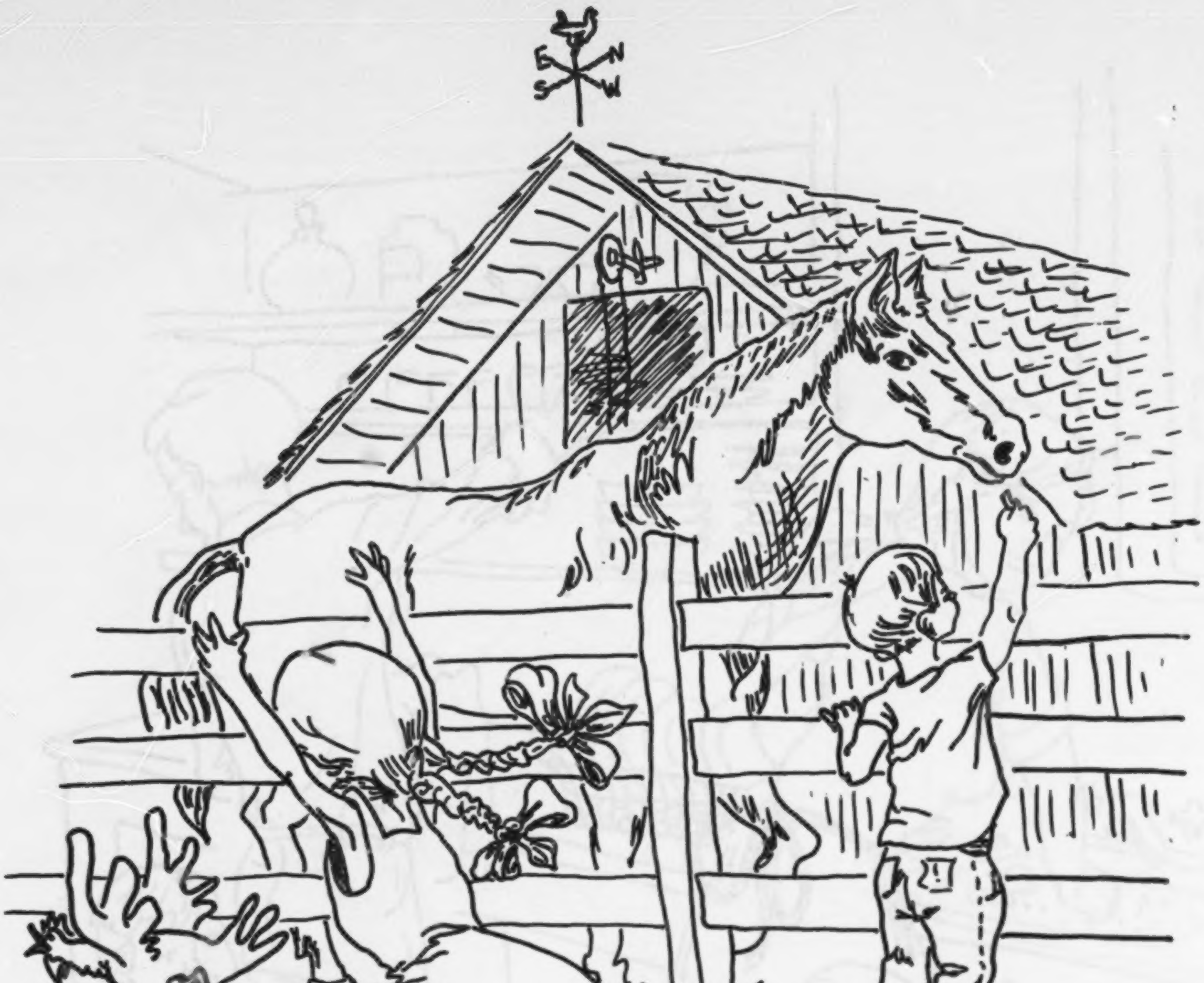

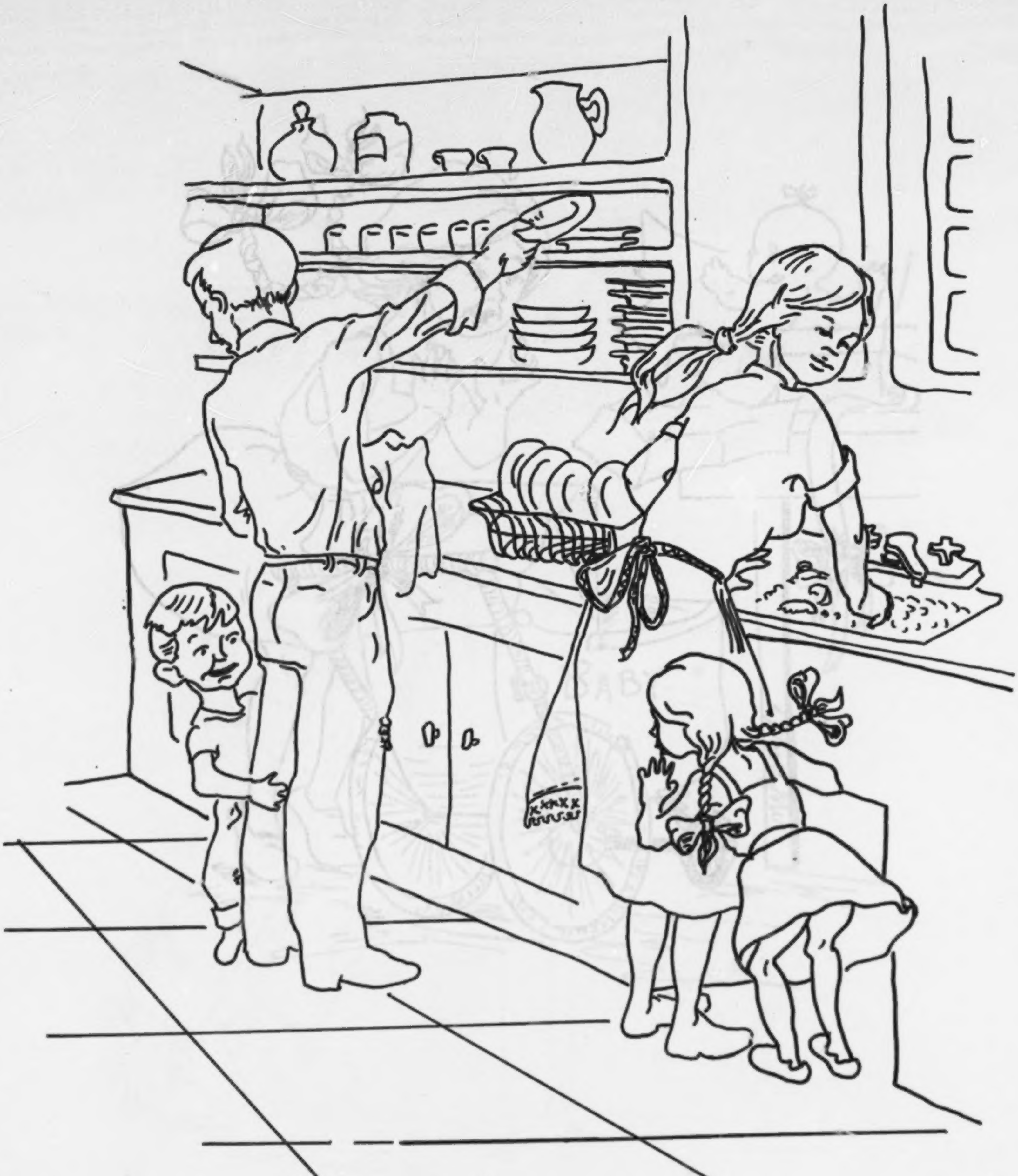

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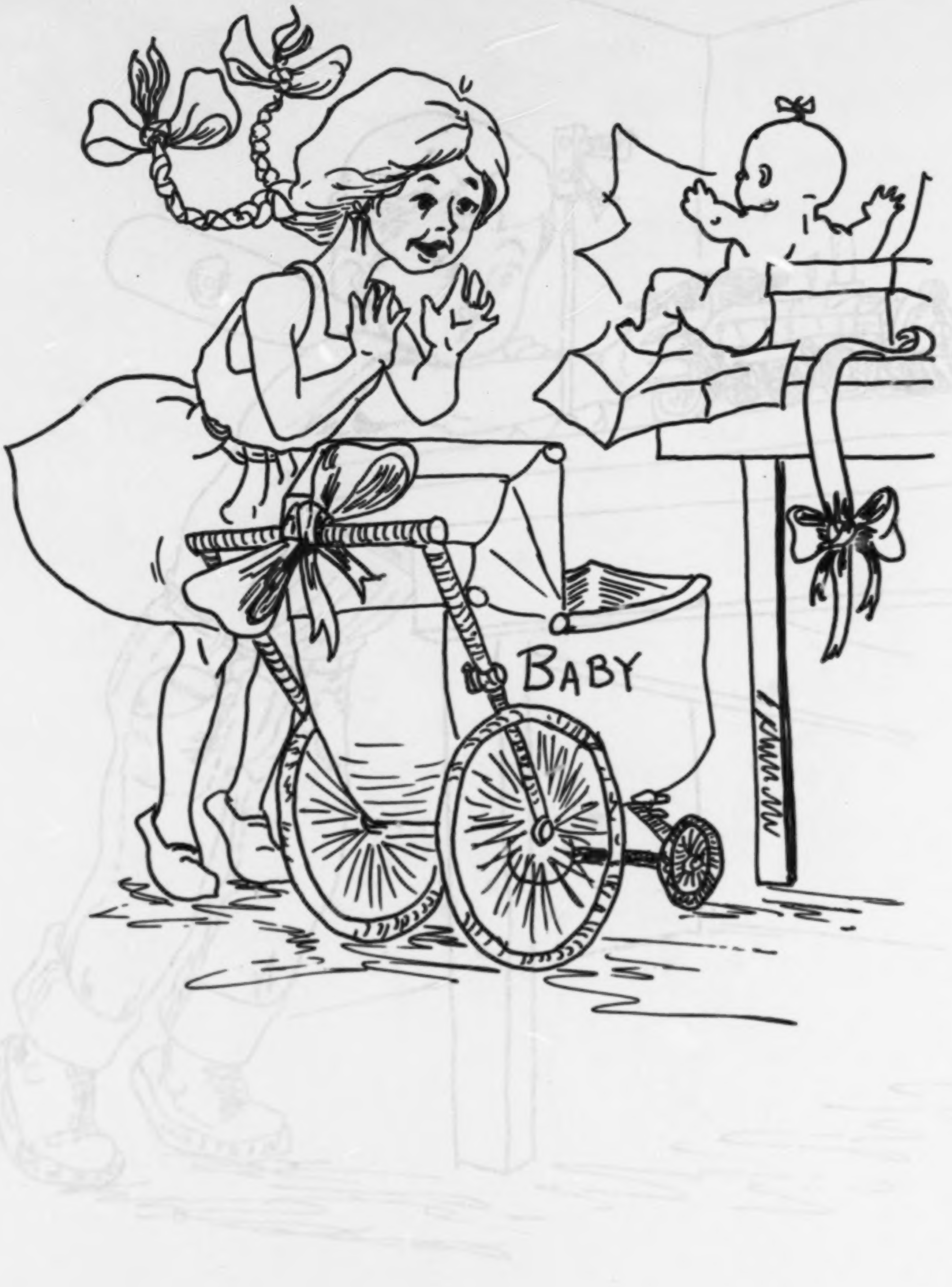

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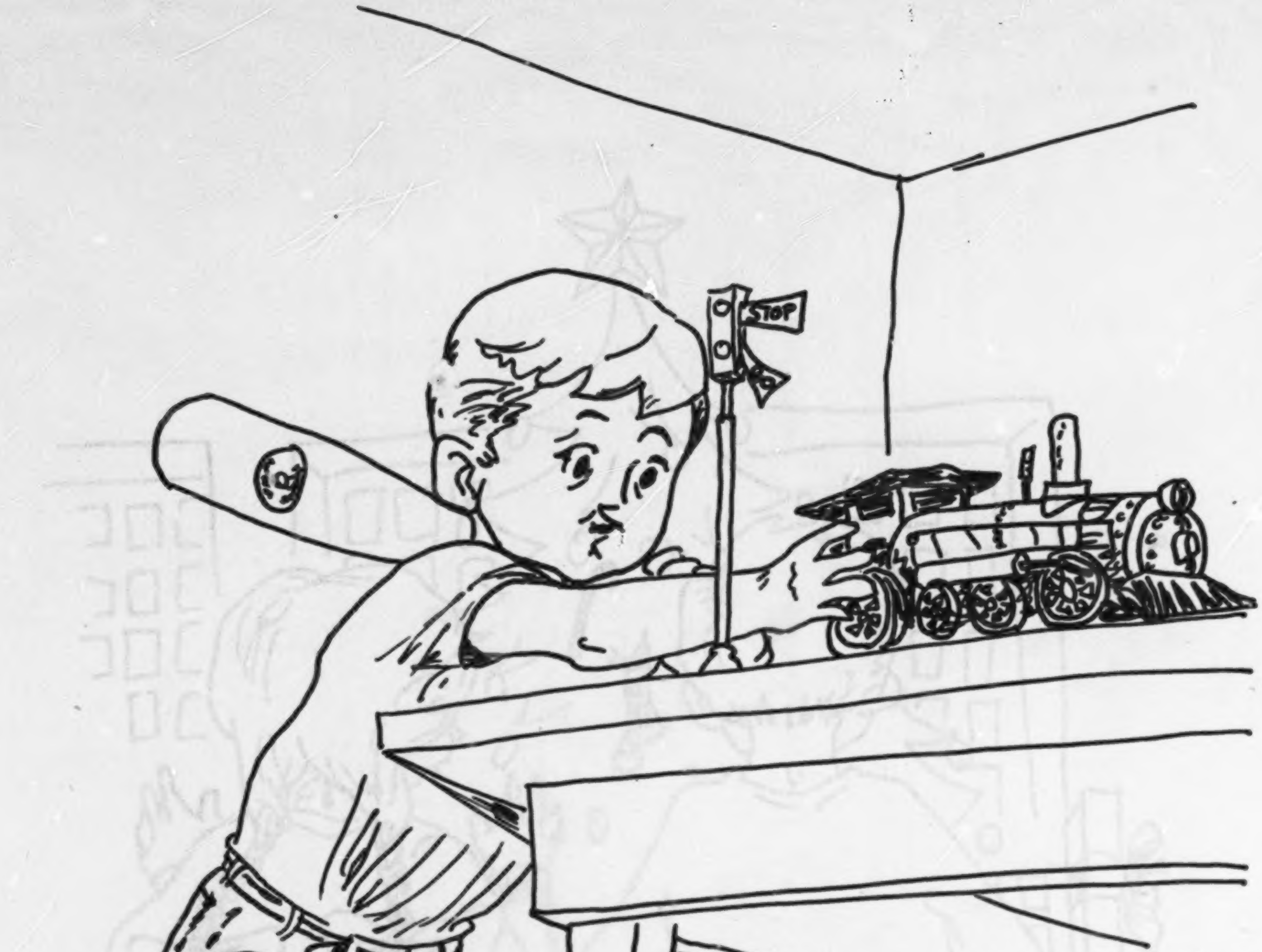

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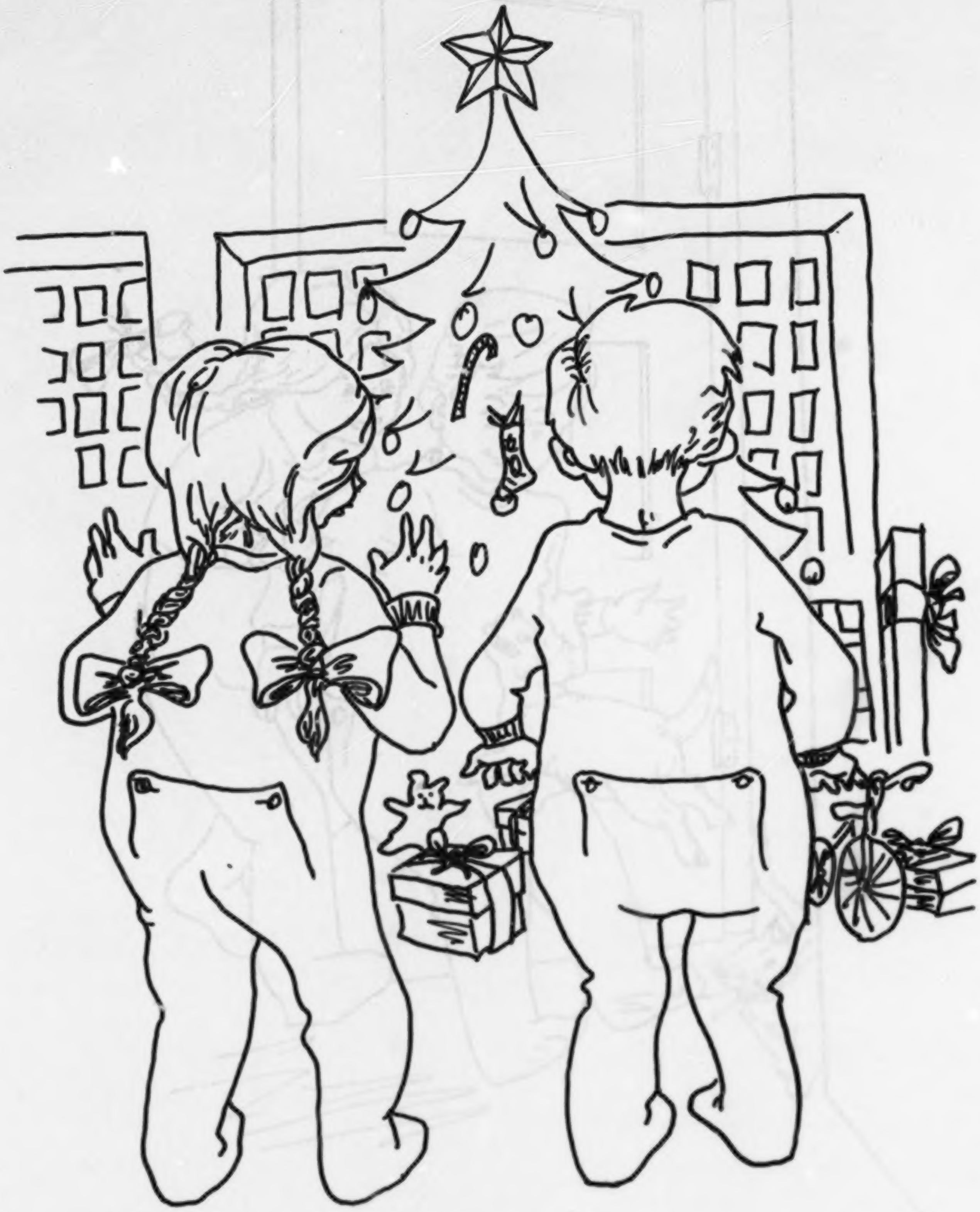

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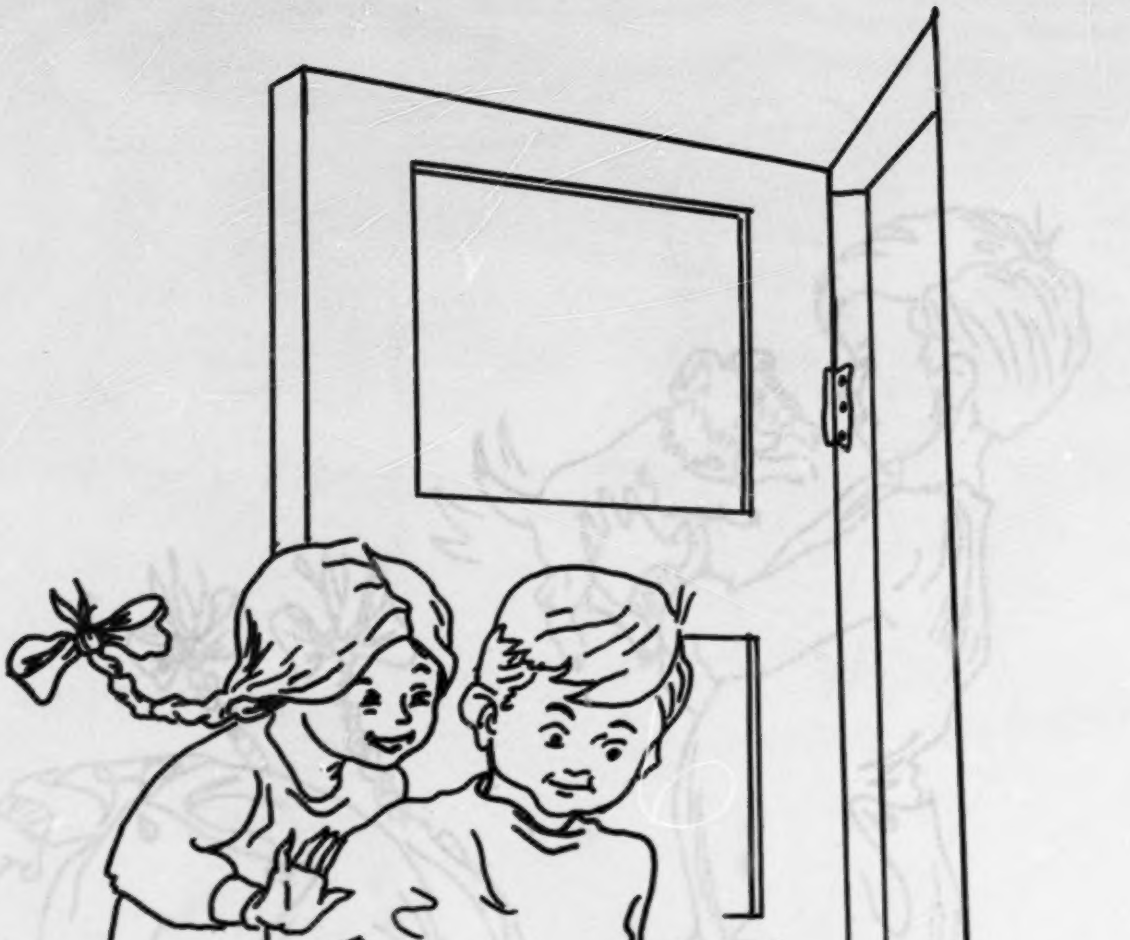

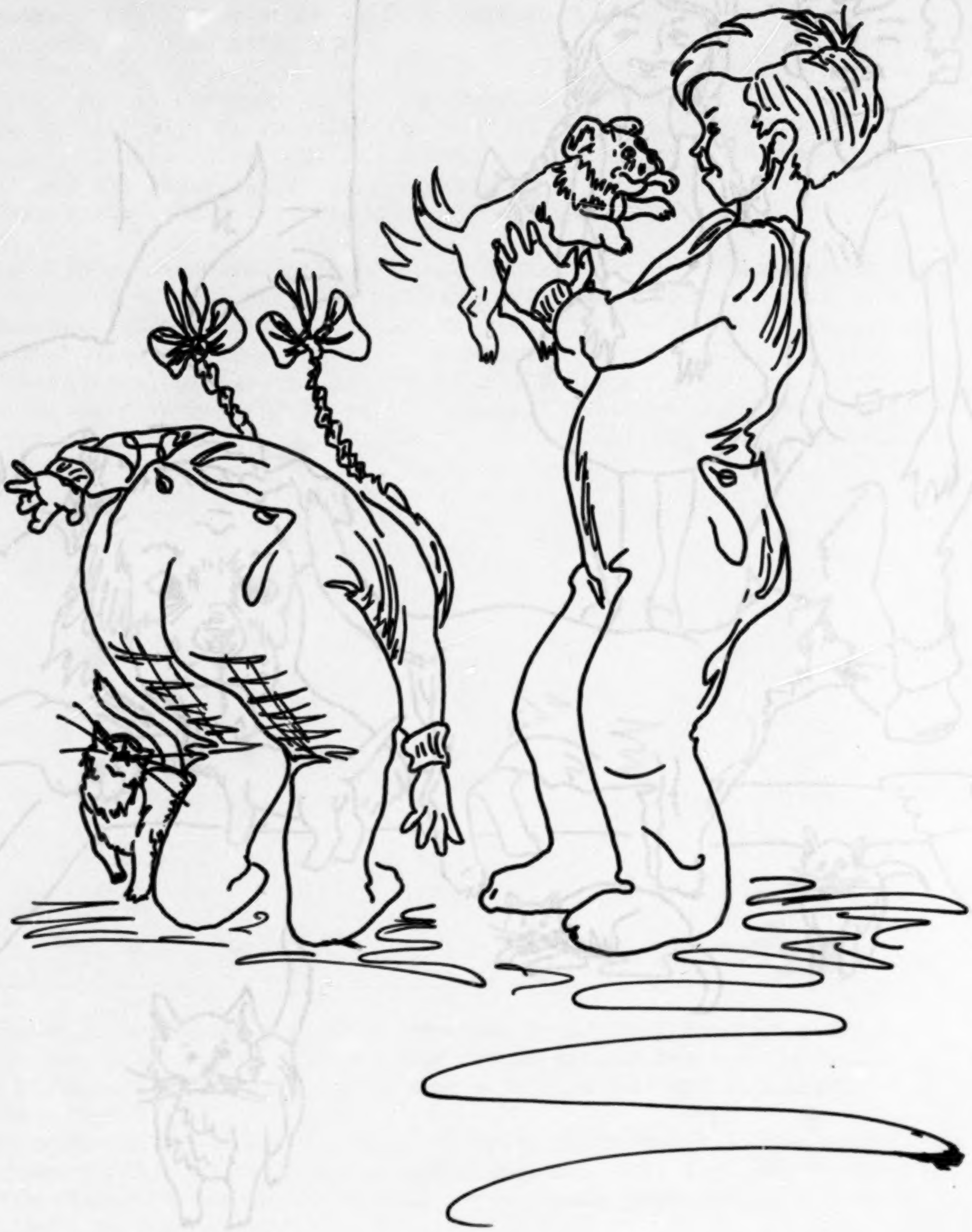

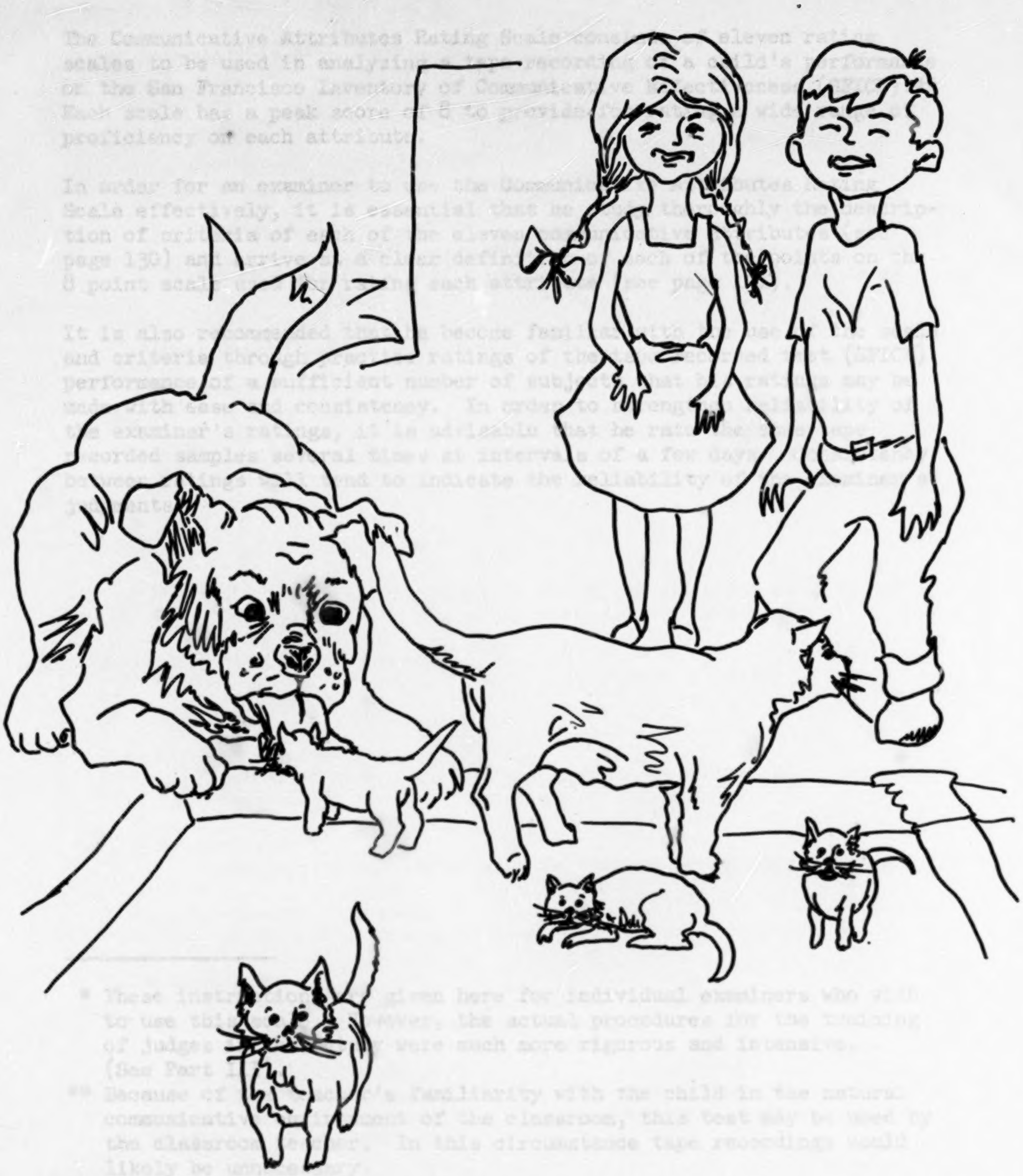

A. COMMUNICATIVE ATTRIBUTES RATING SCALE*
(for scoring SFICE)

The Communicative Attributes Rating Scale consists of eleven rating scales to be used in analyzing a tape recording of a child's performance on the San Francisco Inventory of Communicative Effectiveness (SFICE).** Each scale has a peak score of 8 to provide for rating a wide range of proficiency on each attribute.

In order for an examiner to use the Communicative Attributes Rating Scale effectively, it is essential that he study thoroughly the description of criteria of each of the eleven communicative attributes (see page 130) and arrive at a clear definition of each of the points on the 8 point scale used for rating each attribute (see page 131).

It is also recommended that he become familiar with the use of the scale and criteria through practice ratings of the tape recorded test (SFICE) performance of a sufficient number of subjects that his ratings may be made with ease and consistency. In order to strengthen reliability of the examiner's ratings, it is advisable that he rate the same tape recorded samples several times at intervals of a few days. Consistency between ratings will tend to indicate the reliability of the examiner's judgments.

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* These instructions are given here for individual examiners who wish to use this scale. However, the actual procedures for the training of judges in this study were much more rigorous and intensive. (See Part III).

** Because of the teacher's familiarity with the child in the natural communicative environment of the classroom, this test may be used by the classroom teacher. In this circumstance tape recordings would likely be unnecessary.

SAN FRANCISCO COMMUNICATIVE ATTRIBUTES RATING SCALE

*Description of Criteria

I. Quality of Communicative Relationships

A. Communicative Initiative

1. Immediacy:
How quickly does the subject respond to the stimuli?

2. Frequency:
How often does the subject respond to the stimuli?

3. Enthusiasm:
How much enthusiasm does the subject exhibit in his responses? (The subject may indicate enthusiasm through voice quality as well as through one or more of the attributes enumerated above, but may or may not be genuinely involved in the communicative relationship or situation).

4. Involvement:
What is the degree of the subject's participation in the communicative relationship? Is the child really aware of the examiner as a person with whom to relate as evidenced by his interest in, and sensitivity and response to, the examiner's questions and comments?

B. Ease in Social Situations

How comfortable is the subject in the social situation as reflected in (a) voice quality, (b) pitch, (c) rate, and (d) loudness?

II. Quality of Communicative Behavior

A. Intelligibility

1. Understandability:
How much of what the subject says can be understood or recognized as words?

2. Articulation:
How many speech sounds does the subject produce correctly?

B. Average length of response:
What is the average length of response made by the subject?

C. Appropriateness
How much of the subject's understandable or recognizable speech is relevant or probably relevant to the stimuli?

D. Complexity of ideation
How complex is the content of the subject's responses, i.e., levels of meaning from simple enumeration through denotative, connotative and evaluative responses.

III. Over-all Communicative Effectiveness
What is the total impression of the subject's communicative adequacy or power?

* Since ratings were made from tape recordings, criteria do not include descriptions of non-verbal behavior.

	1	2	3	4	5	6	7	8
Immediacy (Imm)	Extreme delay	Great delay	Much delay	Some delay	Slight delay	Almost immediate	Immediate	Anticipatory
Frequency (Fre)	Almost never	Very seldom	Seldom	Sometimes	Often	Usually	Almost always	Always
Enthusiasm (Ent)	Almost none	Very little	A little	Some	Moderate	Much	Great	Very great
Involvement (Inv)	Almost none	Very little	A little	Some	Moderate	Much	Great	Very great
Ease in Social Situations (Eas)	Extremely uncomfortable	Very uncomfortable	Uncomfortable	Somewhat uncomfortable	Somewhat comfortable	Comfortable	Very comfortable	Completely comfortable
Understandability (Und)	Almost none	Very little	Some	Slightly less than half	Slightly more than half	Much	Most	Almost all
Articulation (Art)	Almost all defective	Most defective	Many defective	Some defective	Few defective	One or two defective	Occasionally defective or indistinct (slightly)	Almost all sounds clearly and correctly made
Average Length of Response (Len)	Extremely short: one word or less	Very short: 1 - 2 words	Short: 2 - 3 words	Moderately short: 3 - 4 words	Moderately long: 4 - 5 words	Long: 5 - 8 words	Very long: 9 - 12 words	Extremely long: twelve words or more
Appropriateness (App)	Almost none	Very little	A little	Some	Much	Most	Almost all	All
Complexity of Ideation (Com)	Simple naming or enumeration	Very simple description & explanation; entirely denotative	Somewhat more complex descr. & expl.; still mostly denotative	Description and explanation with some connotation	Interpretation	Complex Interpretation	Evaluation or generalization	Complex evaluation or generalization; draws a moral
Overall Communicative Effectiveness	Completely ineffective	Very ineffective	Ineffective	Somewhat ineffective	Somewhat effective	Effective	Very effective	Completely effective

San Francisco
COMMUNICATIVE ATTRIBUTES
RATING SCALE

Client ____________

Examiner ____________

Date ____________

Comments ____________

____

To rate subject, encircle appropriate number for each attribute.

B. VERBAL OUTPUT SCALE
(for scoring SFICE)

The Verbal Output Scale provides for the analysis of a representative sample of the subject's verbal responses and can be made from written transcriptions of the subject's performance on (1) SFICE (see page 137 for specific responses to be analyzed) or (2) other representative oral communication. Its use involves: (1) counting the number of words the subject speaks in each test response, (2) counting the number of sentences in each response, (3) scoring each sentence as to level of complexity (see page 133), and (4) counting the number of grammatical elements other than nouns spoken in each response (see page 133).

From this information three final test scores are obtained according to the formula indicated on page 138: (1) Words per Response, (2) Sentence Complexity, (3) Grammatical Complexity.

Rationale for Scoring Sentence Complexity and Grammatical Complexity

The following scoring system was defined as stringently as possible to allow different people to classify the responses with a minimum of subjective interpretation. The scoring rules are primarily based on relationships of words and ideas. No true hierarchy can be established as to the complexity of these relationships (in terms of grammatical elements). Language does not lend itself to such a hierarchy, as examples abound in which any given response might be deemed more advanced than another, despite its form. A complex sentence is frequently less complicated ideationally than a grammatically constituted simple sentence, than an incomplete sentence (or fragment), and conceivably, in context, than even a phrase or single word: e.g., in answer to the question, "Why are the boys fighting?" the reply "They fight when they're mad" is a complex sentence; "That airplane with the broken wing was probably the cause of it all," is a simple sentence; "From that airplane by one boy's foot and those doubled fists and the looks on their faces..." is a fragment; "Contentiousness!" or "Frustration!" is a single word response. Considerable support could be gathered that such responses gained in ideational complexity from the grammatically complex sentence to the single words. Such support, however, would carry with it such elements as appropriateness, inductive or deductive reasoning, observation of detail, and economy of expression; all of these are questions of judgment and interpretation and values.

But because of these and other complications in language usage (note the complexity or "fuller picture" which may be added by adjectives and prepositional phrases), some arbitrary selection of which elements should be scored was unavoidable; otherwise every single word would be considered, which would amount to destroying the concept of complexity through the relationships between the words. While it is true that certain single adjectives show a more developed language level than certain prepositional phrases, and vice-versa, again the question of individual evaluation is encountered. For purposes of this particular test there does not appear to be much variation in what might be called "intrinsic value" of the word or phrase. That an adverb or an infinitive phrase is used at all and how frequently such refinements of the language appear are themselves indicative of the complexity of a child's oral language.

Scoring Sentence Complexity

For each response, the level of sentence complexity was indicated by: (0) for no response or unintelligible responses; (1) for single words (either a single word or a series of words strung together with no apparent relationship - "dog cake girl"); (2) for a phrase or fragment (with the nucleus generally two related words - "boy eating" or "Birthday party"); (3) for a simple sentence; and (4) for a complex sentence.

Scoring Grammatical Complexity

The following grammatical elements were identified and a credit of one point given for each:

a. pronoun (if used as an adjective, no additional credit)

b. adjective (participle) other than articles

c. adverb

d. prepositional phrase (including the 's for the possessive case)

e. conjunction other than and

f. participial phrase

g. infinitive phrase

h. verb phrase (verb plus auxiliary or auxiliaries)

i. direct object (s)

j. compound verbs

k. coordinative interjections, such as "well, ..."

For example, these sentences and phrases were scored as follows:

```
  a.      h.      b.    a. (or i.)*                    sentence complexity - 3
"They're pushing each other":                          grammatical complexity - 4

 a.      a.     a. h.   -1     d.                      sentence complexity - 4
"I know what they's fighting for                       grammatical complexity - 5
         e.
(sigh) cause":

  k.    b.                                             sentence complexity - 2
"Well this airplane broken":                           grammatical complexity - 2

  b.                                                   sentence complexity - 3
"One boy spilled the milk":                            grammatical complexity - 2
```

No credit was given for nouns as such, because they are the kernels of the language and are, at the lowest order, accounted for in the single word category; also they occur almost invariably in fragmented phrases and simple sentences. They were, though, credited as direct objects, as the relationship between the transitive verb and its object is a more complicated one than between a subject and its verb.

The conjunction <u>and</u> was not considered, because too often it is used merely to string simple sentences together and not in a valid connective function. Therefore, two or more simple sentences joined by <u>and</u> were scored as two or more simple sentences, not as a compound sentence. Coordinating conjunctions other than <u>and</u> received credit for the conjunction, so, though not in a separate category, a compound sentence did receive a higher score than merely two simple sentences. Similarly, a complex sentence was scored an initial (4), but if more than one simple sentence were connected to it by <u>and</u>, the additional simple sentences were transferred over to category (3). However, in such a sentence as, "She is eating cake and ice cream," the <u>and</u> is in effect given credit because a point is added for each direct object.

Other scoring rules include:

1. Elliptical sentences were credited as simple sentences (rather than phrases or fragments) when they were replies to the two direct questions of the test, which could logically be preceded by, "The boys (they) are fighting (because) ... ..." or "The teacher (she) will..." This is the normal response in conversation. If, however, the response to the question was given as a complete sentence, extra credit accrued. For example, to "What will the teacher do with the boys who are fighting?" the reply, "Send them to the principal," would be scored:

   sentence complexity - 3
   grammatical complexity - 2
   simple sentence, pronoun, prepositional phrase.

---

* The designations a, h, b, etc. refer to grammatical elements listed under a, b, c, etc. above.

But "she will send them to the principal" would be scored:

sentence complexity - 3
grammatical complexity - 4

simple sentence, pronoun, verb phrase, pronoun, prepositional phrase.

The few instances in which such elliptical sentences as "Don't know," "Guess it's ...," or "Looks like..." occurred were also allowed credit, as this is common colloquially. (See also 8 below).

2. "Gonna," "dunno," and "em" were given full credit as "going to," "don't know," and "them," since such expressions appear to be more a matter of diction than of meaning.

3. Extra words were ignored, whether or not a grammatical error might be involved. For example, in "This boy he....," "he" is omitted; in "Girl all the kids come to the party," "girl" is omitted. Repetition of words was ignored: in "The boy boy play is playing," the sentence was scored as if it read, "The boy is playing."

4. Incomplete prepositional phrases were credited as adverbs.

5. Since like is so extensively used for as if, it was counted as a subordinate conjunction when used in that way.

6. Ice cream was counted as a single word.

7. Real for very and got for have were not discredited.

8. Subordinate clauses standing alone were scored as simple sentences, with credit for the conjunction or relative pronoun, whether or not they were in answer to a direct question.

9. When "I guess" or "I think" preceded a sentence, it was considered as complex, with a that understood; when such an expression ended a sentence, it was considered parenthetical, and it was scored as a separate simple sentence.

As much credit as possible is given in each case; the children always received the benefit of any doubt. However, as complexity does involve knowledge of correct usage, a demerit (-1) was given for certain grammatical errors, such as wrong case of pronoun ("Him was crying"), lack of agreement between subject and verb ("He play with airplane"), and transitive use of an intransitive verb ("She will sit them down"). The demerit only obtained when there was a clear grammatical error. It was impossible to assume what incipient errors lurked in the fragments or unintelligibile portions.

One might suggest that the child who is more voluble or intelligible and/or uses more sentences provides more area for literacy errors, and that therefore he can be penalized, whereas a child just using simple phrases or single words gives the scorer little opportunity to check grammatical accuracy. But this is not borne out, because a single word or fragment response is already penalized (having a lower sentence complexity score than sentences), and the child knowing enough grammar to allow for a mistake has enough + 1's to offset the penalties.

Because, despite efforts to the contrary, personal judgment sometimes did enter the picture, it was noted that any one total score would not be changed, because of shifts of judgment, by more than one or two points. It was clearly demonstrated that the children who frequently used complete sentence structure were also those who used more complicated sentences, more grammatical accuracy, and larger vocabularies.

When there were questions of interpretation, Webster's Collegiate Dictionary (1958) and A Dictionary of Contemporary American Usage, by Bergen Evans and Cornelia Evans, were the authorities relied upon.

The Verbal Output Scale was used in analyzing nine responses from the San Francisco Inventory of Communicative Effectiveness. These responses were selected for verbal output analysis in this study because of their demonstrated motivating power and because they occurred approximately at a mid-point in the test at which time the majority of subjects communicated relatively freely and comfortably. On page 137 is a sample of a child's (John B.) actual response to this section of the test. A recapitulation of the test results for John B. appear on the scoring form of the San Francisco Verbal Output Scale, page 138.

Sample Performance on
Nine Responses of SFICE for Analysis by
Verbal Output Scale

Subject John B.

Response No.

Picture 1.

Ex: Now I'm going to show you another picture and I want you to tell me a story about it.

1 P: ah ah a birthday party ah

Ex: Tell me more about it.

2 P: ah um ah ah girl is eating some ice cream and the boy is blowing out candles and

Ex: Tell me more.

3 P: and uh with the glass and another boy is with some ice cream and the doggie

Ex: Um huh.

Picture 2.

Ex: Why are they fighting?

4 P: ah I think they're fightin over the airplane

Ex: Tell me more about why they're fighting.

5 P: um um I don't know what they're fighting for um

Ex: Tell me more.

6 P: Um

Ex: What will the teacher do with the boys who are fighting?

7 P: ah tell em (to) sit down

Ex: Tell me more about what the teacher will do with the boys.

8 P: ah face em into the corner

Ex: Tell me more.

9 P: um may send them down to a office

Ex: Um huh.

SAN FRANCISCO
VERBAL OUTPUT SCALE
(Scoring Sample)

Client's Name John B. Examiner__________ Date______

Response Number	A Number of Words in Each Response	B Number of Sentences in Each Response	C Sentence Complexity Score	D Grammatical Complexity Score
1	3	1	2	0
2	14	2	6	6
3	15	3	3	3
4	8	1	4	4
5	9	1	4	7
6	0	0	0	0
7	5	1	3	3
8	5	1	3	2
9	7	1	3	4
TOTALS	66	11	28	29

Words per response (average):

$$\frac{\text{Total Column A}}{\text{No. of Responses}} = \frac{66}{9} = \frac{7.33}{\text{Words per Response}}$$

Sentence Complexity:

$$\frac{\text{Total Column C}}{\text{Total Column B}} = \frac{28}{11} = \frac{2.55}{\text{Sentence Complexity}}$$

Grammatical Complexity:

$$\frac{\text{Total Column D}}{\text{Total Column B}} = \frac{29}{11} = \frac{2.64}{\text{Grammatical Complexity}}$$

SAN FRANCISCO ARTICULATION PROFILE

This test provides for the evaluation of articulatory accuracy in the production of 24 consonant sounds in (1) naming responses to 66 picture items including initial, medial, and final positions, (2) word imitation of names of 66 picture items including initial, medial, and final positions, and (3) sound imitation of each sound in isolation.* Specific test sounds are rated in each test item on a 6 point scale representing (1) correct articulation, (2, 3, 4) distortion, (5) substitution, and (6) omission of consonant sounds. Ratings on this test may be made of the actual speaking performance or from tape recordings. Both methods have been found to be reliable (42, 45).

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* After the manner of rating reported by Milisen and associates (24).

SAN FRANCISCO ARTICULATION PROFILE

Name____________________ Examiner______________ Date___________ Tape #____

Pict = Picture naming
Word = Word imitation

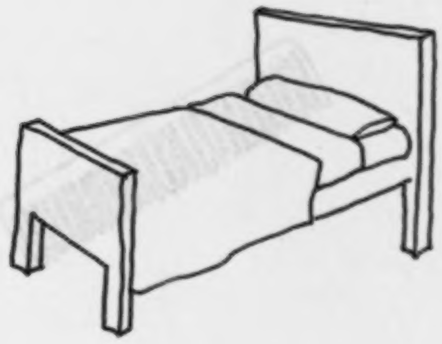
				Distortn				
			Correct	Mild	Moderate	Severe	Substitutn.	Omission
			1	2	3	4	5	6
b	BED	Pict.						
		Word						
	COWBOY	Pict.						
		Word						
	BATHTUB	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
p	PENCIL	Pict.						
		Word						
	APPLE	Pict.						
		Word						
	CUP	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
m	MONKEY	Pict.						
		Word						
	HAMMER	Pict						
		Word						
	COMB	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
w	WATER	Pict						
		Word						
	SANDWICH	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
h	HOUSE	Pict.						
		Word						
	BIRDHOUSE	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
d	DOG	Pict						
		Word						
	LADDER	Pict						
		Word						
	BREAD	Pict						
		Word						
	Imitated Sound							

				Distortn.				
			Correct	Mild	Moderate	Severe	Substitutn.	Omission
			1	2	3	4	5	6
t	TABLE	Pict.						
		Word						
	SANTA CLAUS	Pict.						
		Word						
	BOAT	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
n	KNIFE	Pict.						
		Word						
	WINDOW	Pict.						
		Word						
	SPOON	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
g	GUN	Pict						
		Word						
	WAGON	Pict.						
		Word						
	FLAG	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
k	CAR	Pict						
		Word						
	COOKIE	Pict						
		Word						
	BOOK	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
ŋ	FINGER	Pict						
		Word						
	SWING	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
j	YELLOW	Pict						
		Word						
	YO YO	Pict						
		Word						
	Imitated Sound							

Pict. = Picture naming
Word = Word imitation

			Correct	Distortn.			Substitutn.	Omission
				Mild	Moderate	Severe		
			1	2	3	4	5	6
f	FORK	Pict.						
		Word						
	COFFEE	Pict.						
		Word						
	KNIFE	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
v	VALENTINE	Pict.						
		Word						
	SHOVEL	Pict.						
		Word						
	STOVE	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
ʃ	SHOE	Pict						
		Word						
	WASHING MACHINE	Pict.						
		Word						
	FISH	Pict.						
		Word						
	Imintated Sound							
			1	2	3	4	5	6
ʒ	TELEVISION	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
l	LAMP	Pict.						
		Word						
	TELEPHONE	Pict.						
		Word						
	BALL	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
ð	THIS-THAT	Pict.						
		Word						
	FEATHER	Pict.						
		Word						
	SMOOTH	Pict.						
		Word						
	Imitated Sound							

			Correct	Distortn.			Substitutn.	Omission
				Mild	Moderate	Severe		
			1	2	3	4	5	6
θ	THUMB	Pict						
		Word						
	BIRTHDAY	Pict						
		Word						
	MOUTH	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
z	ZIPPER	Pict						
		Word						
	SCISSORS	Pict						
		Word						
	NOSE	Pict						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
s	SANTA CLAUS	Pict.						
		Word						
	GLASSES	Pict.						
		Word						
	HORSE	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
r	RAIN	Pict.						
		Word						
	CARROT	Pict.						
		Word						
	DOOR	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
dʒ	JUMP	Pict.						
		Word						
	ORANGE JUICE	Pict.						
		Word						
	ORANGE	Pict.						
		Word						
	Imitated Sound							
			1	2	3	4	5	6
tʃ	CHAIR	Pict.						
		Word						
	MATCHES	Pict.						
		Word						
	WATCH	Pict.						
		Word						
	Imitated Sound							



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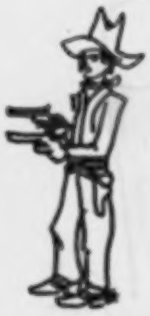

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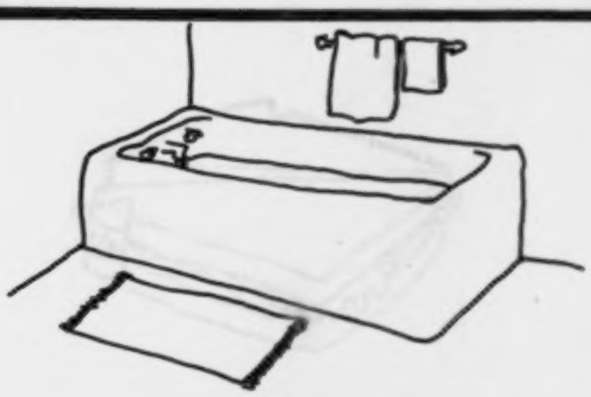

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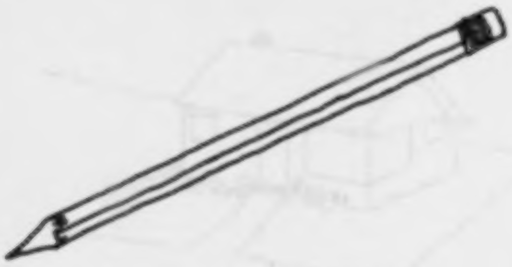

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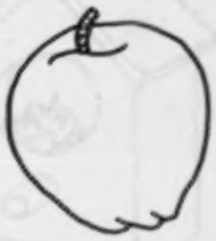

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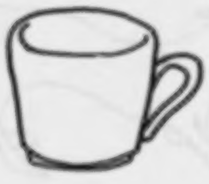

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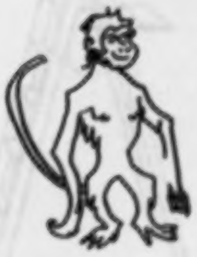

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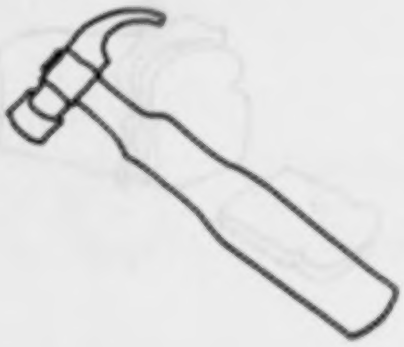

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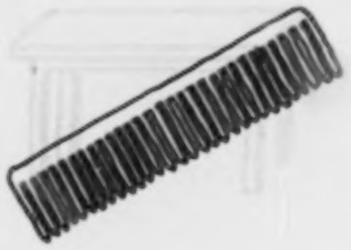

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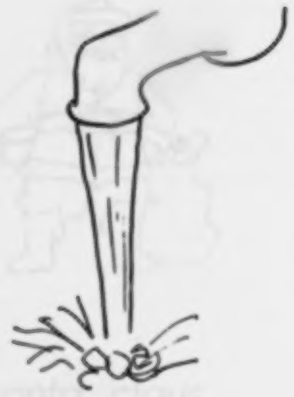

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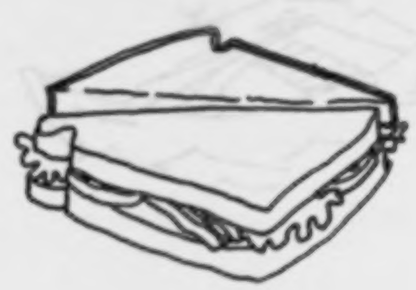

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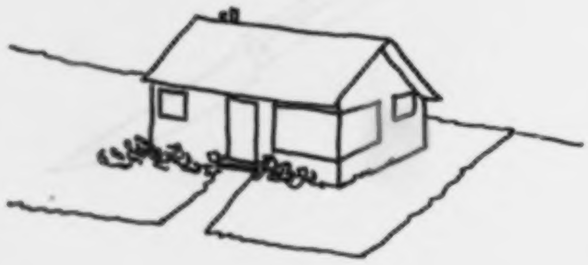

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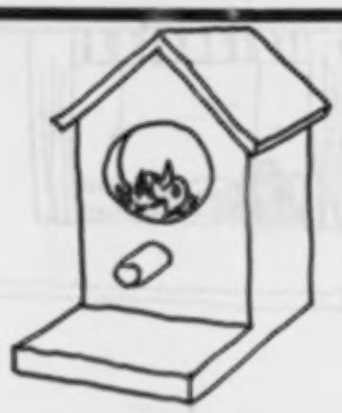

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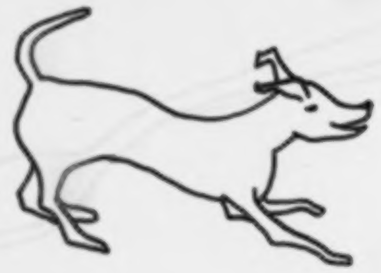

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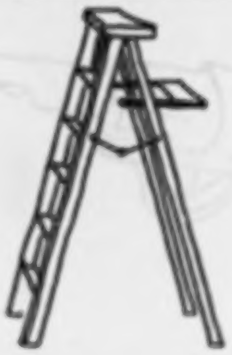

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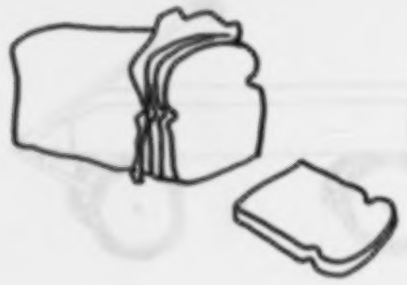

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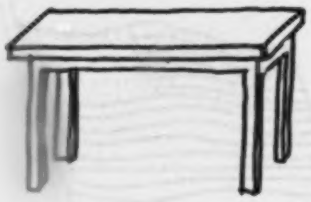

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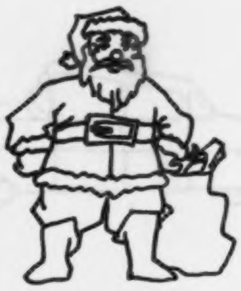

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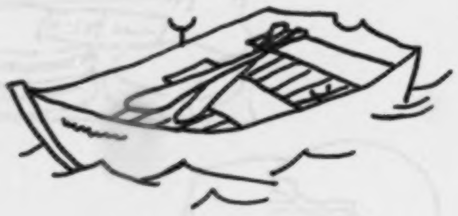

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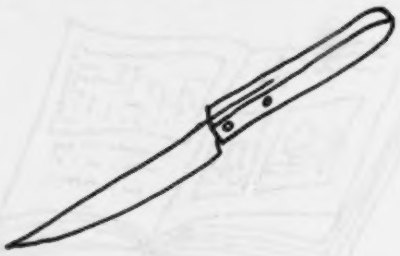

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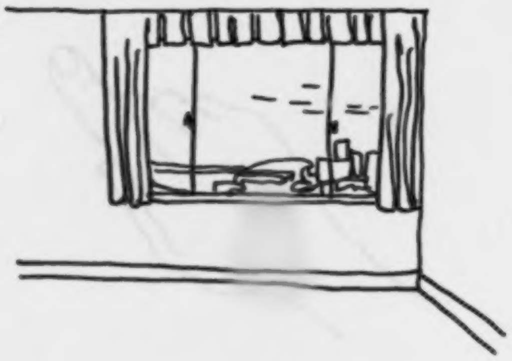

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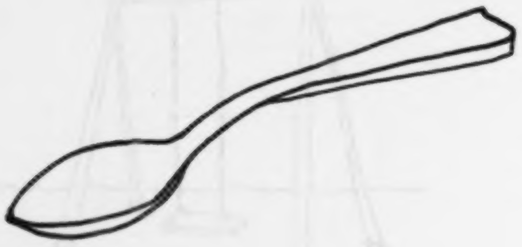

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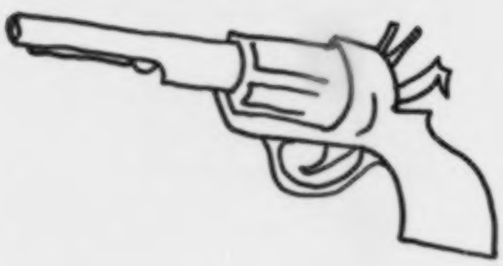

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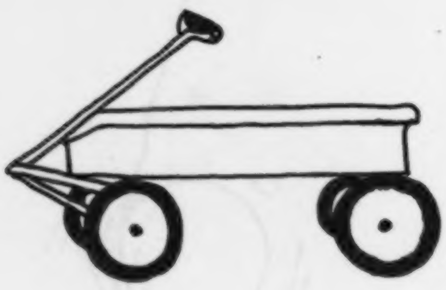

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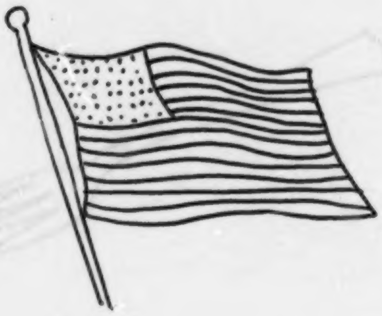

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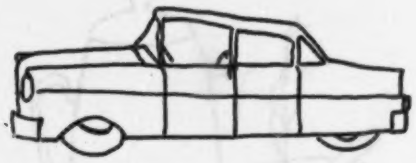

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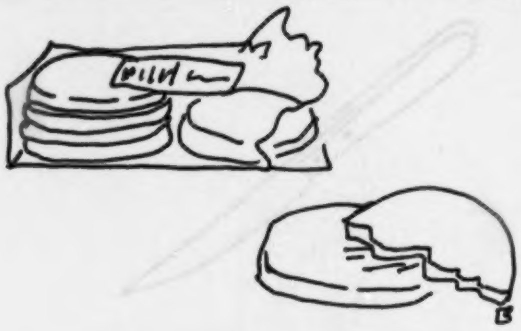

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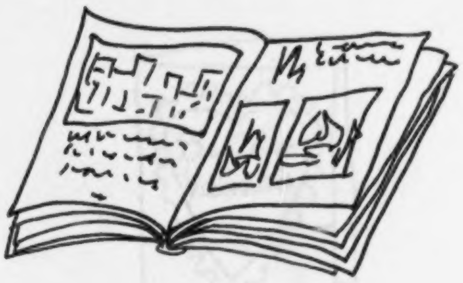

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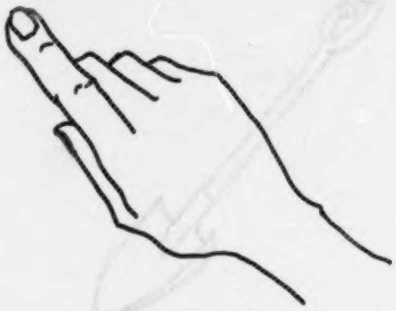

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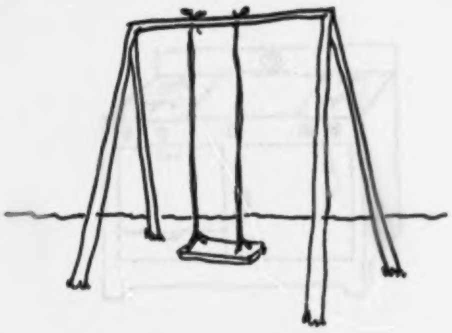

swing

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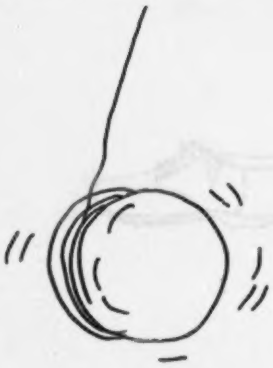

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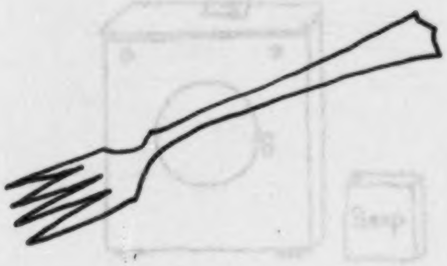

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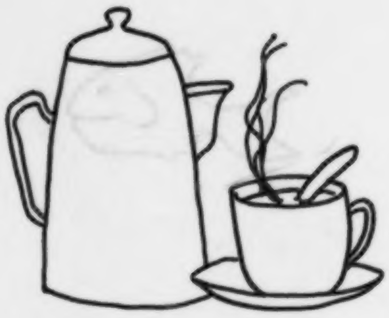

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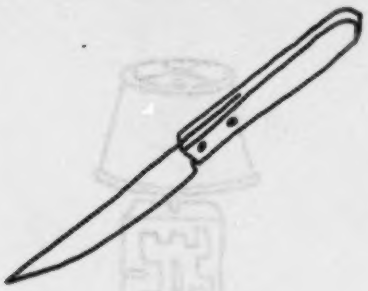

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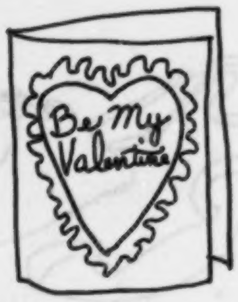
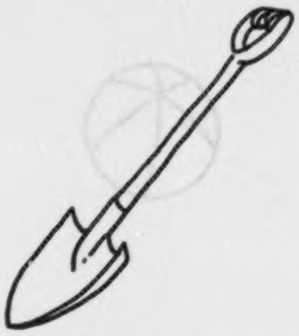


valentine

Be My Valentine



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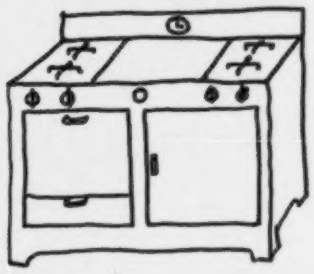

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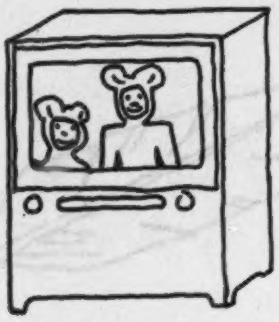

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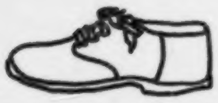

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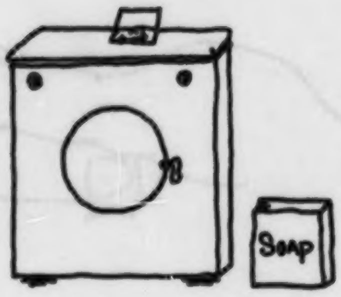

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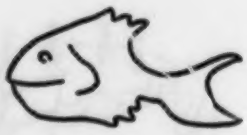

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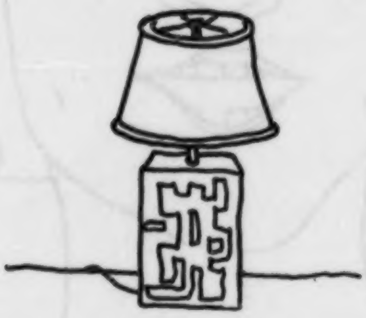

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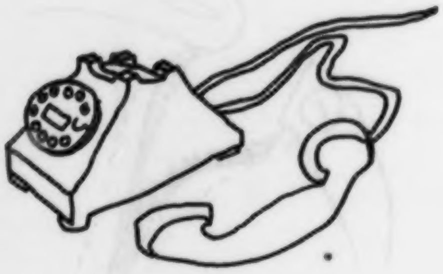

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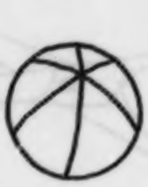
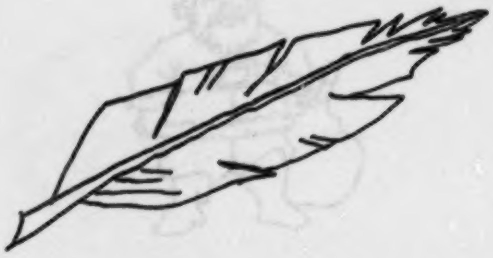


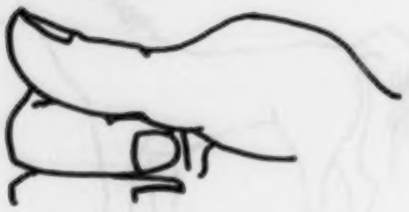
ball

this - that

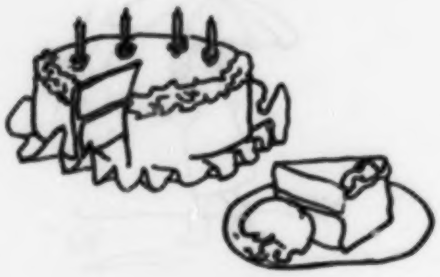


feather

smooth



thumb



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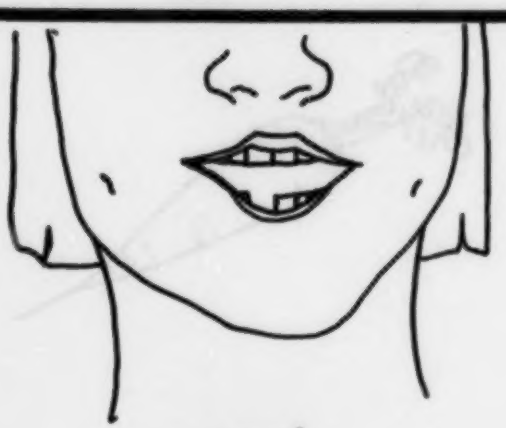

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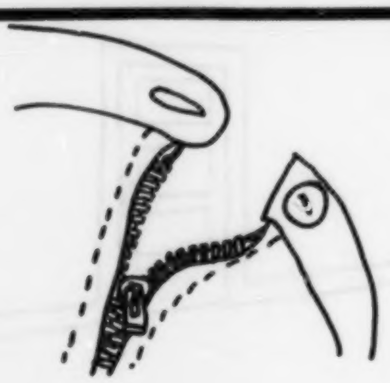

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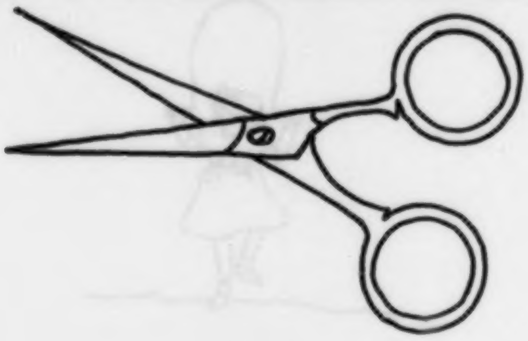

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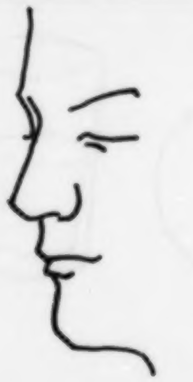

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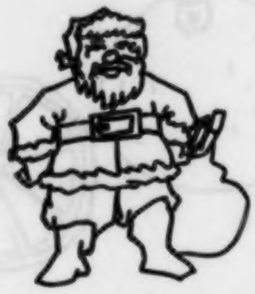

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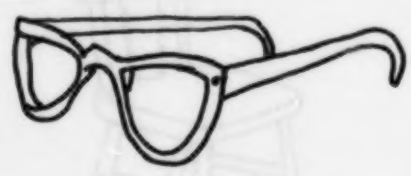

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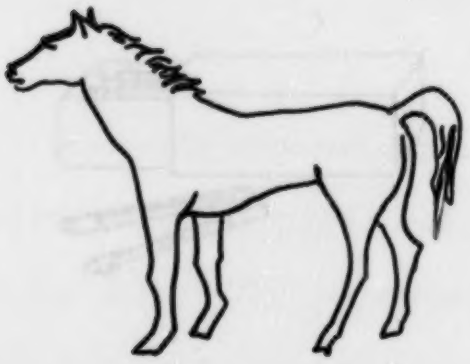

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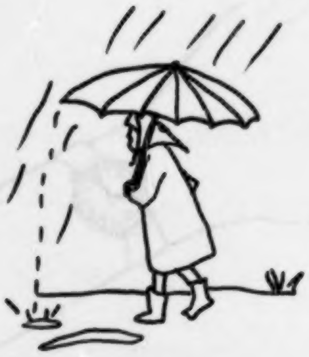

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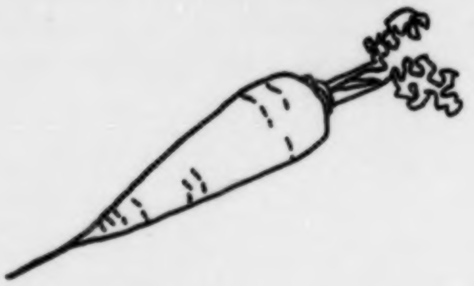

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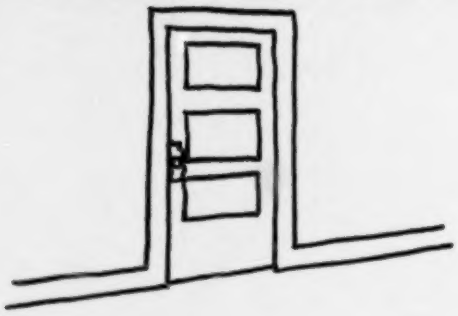

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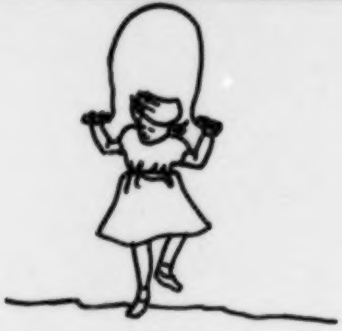

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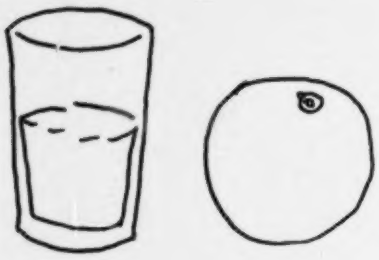

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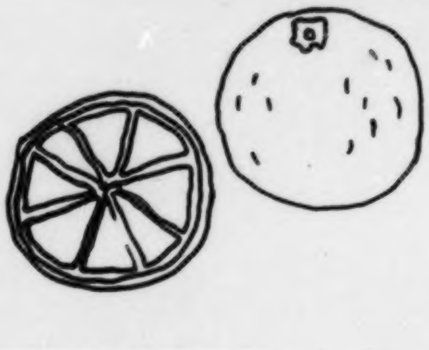
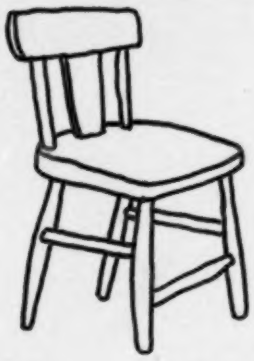


orange



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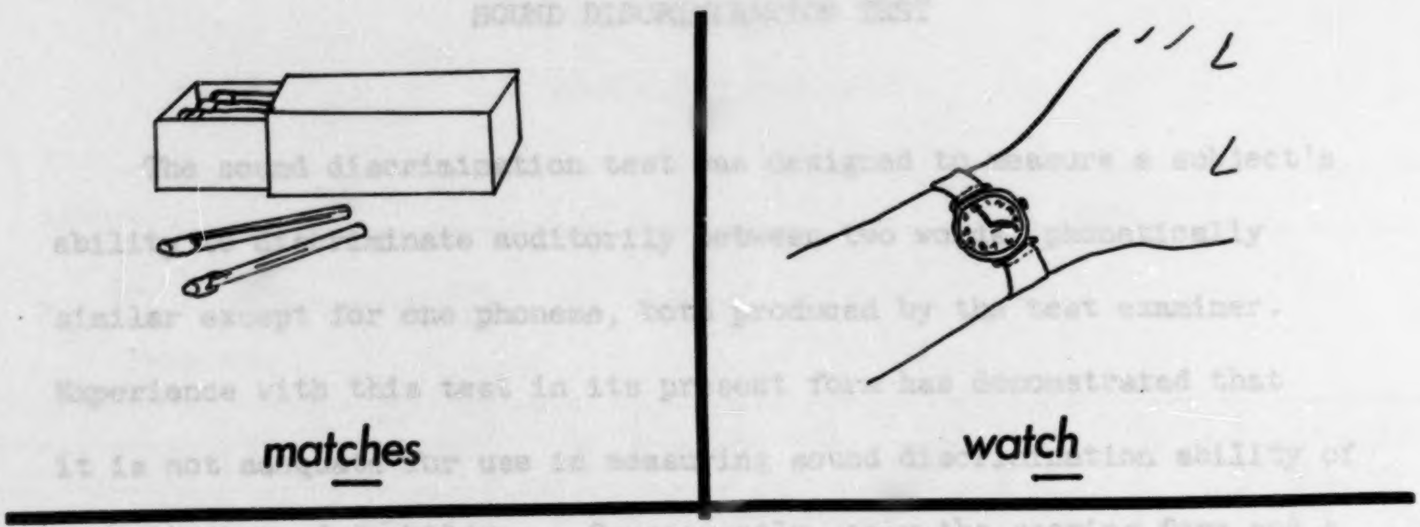

matches
watch

SOUND DISCRIMINATION TEST

The sound discrimination test was designed to measure a subject's ability to discriminate auditorily between two words, phonetically similar except for one phoneme, both produced by the test examiner. Experience with this test in its present form has demonstrated that it is not adequate for use in measuring sound discrimination ability of mentally retarded children. Consequently, only the scoring form and a sample of the test materials are included here.

SOUND DISCRIMINATION TEST

Name________________________ School________________________

Examiner________________________ Date________________

RIGHT C WRONG V NO RESPONSE N

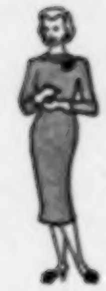
COMMENTS:

SHORT FORM

	DAME - GAME
	GATE - EIGHT
	YEAR - EAR
	VASE - BASE
	SHOE - CHEW
	WATCH - WASH
	LIGHT - WHITE
	GLASS - GAS
	DAY - THEY
	M - THEM
	TREE - THREE
	TEA - TEETH
	DIPPER - ZIPPER
	HOE - HOSE
	BANK - THANK
	RING - WING
	JUMP - DUMP
	SHIP - CHIP

LONG FORM

b		EAT - BEET
		EYE - BUY
		ROW - ROBE
p		PEAR - HAIR
		EYE - PIE
		ROW - ROPE
		PIE - PIPE
m		EAT - MEAT
		MAKE - ACHE
		HOME - HOE
w		WEIGH - A
		WALL - ALL
h		HILL - ILL
		EAT - HEAT
d		GRAPES - DRAPES
		EAR - DEER
		CARD - CAR
t		TOP - COP
		BACK - BAT
		BOW - BOAT
		FORT - FOUR
n		DEAD - NED
		NOSE - DOZE
g		DRAPES - GRAPES
k		TOP - COP
		CAP - TAP
		CRACK - TRACK
		BAT - BACK
		FOUR FORK
ŋ		THIN - THING
		LAWN - LONG
f		FEET - PETE
		FOUR - POUR
		FIRE - TIRE
v		ME - V
		BEST - VEST
ʃ		CHIP - SHIP
		SHOE - SUE
		SHOW - TOE
		DISH - DITCH
l		WAKE - LAKE
		YAWN - LAWN
		LOAD - ROAD
		BACK - BLACK
ð		DOZE - THOSE
θ		THANK - TANK
		INK - THINK
		RED - THREAD
		BAT - BATH
		MOUTH - MOUSE
z		ROW - ROSE
s		SKY - TIE
		SHEEP - SLEEP
		TOP - STOP
		RING - STRING
		COOL - SCHOOL
		SINK - INK
		MOUSE - MOUTH
r		ONE - RUN
		WRITE - LIGHT
		RAKE - LAKE
dʒ		JELLO - YELLOW
		BAD - BADGE
tʃ		SHOE - CHEW
		CHAIR - TEAR
		CHEW - TWO
		WASH - WATCH



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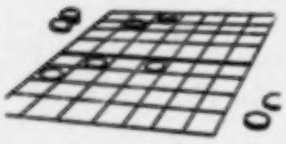

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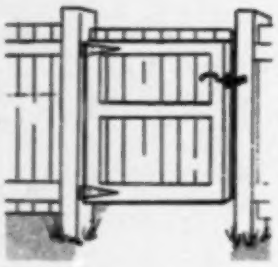
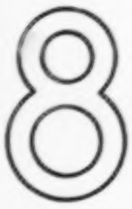
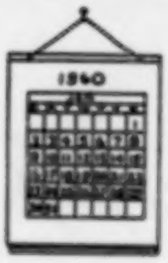


gate



eight



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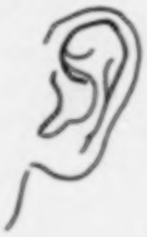

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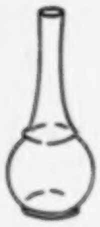

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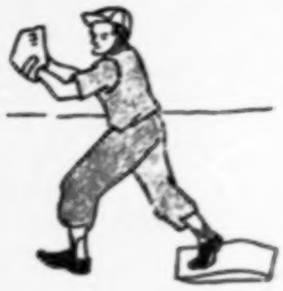

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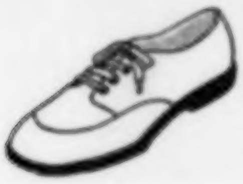

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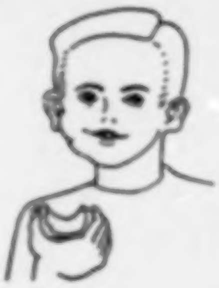

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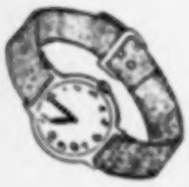

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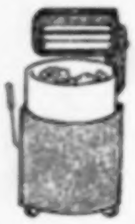

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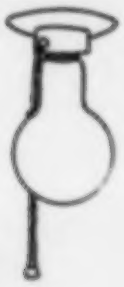

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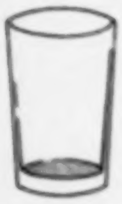
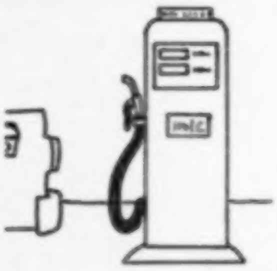
white



glass



gas

APPENDIX E

TABLES OF INTER-JUDGE AGREEMENT

TABLE 7

CORRELATION BETWEEN JUDGES'PRE-TEST RATINGS ON THE COMMUNICATIVE ATTRIBUTES RATING SCALE (Control Group)

Communicative Attributes	JUDGES			Median Correl.
	H. vs. L.	L. vs. G.	H. vs. G.	
1. Immediacy	.62	.75	.64	.64
2. Frequency	.74	.79	.77	.77
3. Length	.79	.82	.94	.82
4. Enthusiasm	.78	.67	.69	.69
5. Involvement	.76	.85	.75	.76
6. Understandability	.72	.89	.72	.72
7. Articulation	.70	.73	.67	.70
8. Appropriateness	.62	.51	.79	.62
9. Ease	.78	.75	.82	.78
10. Complexity	.81	.78	.84	.81
11. Over-all	.83	.90	.89	.89
Composite Scores (Mathematical Totals)				
Commun. Initiative: Attributes 1+2+3+4+5	.84	.91	.88	.88
Intelligibility: Attributes 6+7	.74	.86	.72	.74
Overall Composite: All attributes except 11	.88	.89	.92	.89

TABLE 8

CORRELATION BETWEEN INDIVIDUAL JUDGE'S LIVE RATINGS AND AVERAGE OF THE OTHER THREE JUDGES' TAPE RATINGS FOR THE ARTICULATION PROFILE (Random Sample)

Judge	N	No. of total scores* on which correlations were computed	r
KM	12	36	.90
VA	16	48	.91
BG	23	69	.93
JM	33	99	.90

*Total scores were obtained for each subject on three sets of test items representing sounds in (1) initial, (2) medial and (3) final positions.

APPENDIX F

TABLES OF STATISTICAL ANALYSES OF RESULTS

(Appendix F)

SAN FRANCISCO INVENTORY OF COMMUNICATIVE EFFECTIVENESS

COMMUNICATIVE ATTRIBUTES RATING SCALE

TABLES OF F RATIOS

TABLE 9

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL THERAPY AND CONTROL GROUPS ON THE COMMUNICATIVE ATTRIBUTES RATING SCALE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
RATINGS							
Immediacy							
Conventional	24	2.72	15.42	2.67	17.04	(17.12)	4.401*
Control	37	3.61	15.68	4.15	15.70	(15.60)	
Frequency							
Conventional	24	2.81	19.29	3.26	20.42	(20.20)	1.554
Control	37	4.53	18.70	4.59	18.97	(19.17)	
Length							
Conventional	24	4.27	13.54	5.54	15.38	(16.61)	<1
Control	37	4.86	13.16	5.71	14.38	(13.23)	
Enthusiasm							
Conventional	24	3.99	11.88	4.22	13.04	(12.83)	<1
Control	37	4.77	11.35	4.79	12.43	(12.60)	
Involvement							
Conventional	24	4.19	13.92	3.95	15.08	(14.68)	3.974
Control	37	4.69	12.86	5.54	14.03	(14.48)	
Understandability							
Conventional	24	5.19	16.12	5.23	17.04	(17.53)	<1
Control	37	5.32	17.19	5.50	17.35	(16.91)	
Articulation							
Conventional	24	3.06	11.50	3.14	12.00	(12.65)	<1
Control	37	3.93	12.95	3.57	12.78	(12.18)	
Appropriateness							
Conventional	24	4.37	17.21	3.97	17.54	(16.96)	<1
Control	37	4.43	15.62	4.91	16.62	(17.28)	
Ease							
Conventional	24	3.59	14.29	3.98	15.58	(15.46)	2.091
Control	37	4.46	13.97	4.07	14.24	(14.33)	
Complexity							
Conventional	24	4.26	9.21	4.45	10.21	(9.89)	<1
Control	37	3.76	8.51	4.77	9.65	(10.00)	
Over-all							
Conventional	24	4.45	10.46	5.28	11.92	(11.50)	<1
Control	37	4.81	9.65	5.80	11.46	(11.84)	
MATH. COMPOSITES							
Comm. Initiative							
Conventional	24	15.89	74.04	16.54	80.96	(79.94)	<1
Control	37	20.79	71.76	23.43	75.51	(76.45)	
Intelligibility							
Conventional	24	7.99	27.62	8.05	29.04	(30.19)	1.158
Control	37	8.83	30.14	8.76	30.14	(29.04)	
Over-all Comm. Eff.							
Conventional	24	30.38	142.38	32.58	153.33	(152.19)	<1
Control	37	36.31	140.00	42.43	146.16	(147.29)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

TABLE 10

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY COMMUNICATION-CENTERED THERAPY AND CONTROL GROUPS ON THE COMMUNICATIVE ATTRIBUTES RATING SCALE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
RATINGS							
Immediacy							
Comm.-Centered	29	3.92	16.34	3.75	16.55	(16.83)	<1
Control	37	3.61	15.68	4.15	15.70	(15.60)	
Frequency							
Comm.-Centered	29	5.42	18.41	4.17	19.76	(19.54)	1.2333
Control	37	4.53	18.70	4.59	18.97	(19.17)	
Length							
Comm.-Centered	29	6.03	14.21	5.79	15.69	(15.42)	<1
Control	37	4.86	13.16	5.71	14.38	(13.23)	
Enthusiasm							
Comm.-Centered	29	5.23	13.62	5.06	13.83	(13.25)	<1
Control	37	4.77	11.35	4.79	12.43	(12.60)	
Involvement							
Comm.-Centered	29	5.95	14.03	5.34	14.86	(14.82)	<1
Control	37	4.69	12.86	5.54	14.03	(14.48)	
Understandability							
Comm.-Centered	29	6.12	16.72	5.76	17.59	(17.32)	<1
Control	37	5.32	17.19	5.50	17.35	(16.91)	
Articulation							
Comm.-Centered	29	4.11	12.31	4.12	12.72	(12.35)	1.244
Control	37	3.93	12.95	3.57	12.78	(12.18)	
Appropriateness							
Comm.-Centered	29	4.96	16.00	5.42	16.24	(16.77)	<1
Control	37	4.43	15.62	4.91	16.62	(17.28)	
Ease							
Comm.-Centered	29	4.41	15.48	3.97	15.86	(15.46)	2.805
Control	37	4.46	13.97	4.07	14.24	(14.33)	
Complexity							
Comm.-Centered	29	5.31	9.79	4.98	10.59	(10.34)	<1
Control	37	3.76	8.51	4.77	9.65	(10.00)	
Over-all							
Comm.-Centered	29	6.06	11.14	6.31	12.14	(151.81)	<1
Control	37	4.81	9.65	5.80	11.46	(147.29)	
MATH. COMPOSITES							
Comm. Initiative							
Comm.-Centered	29	25.05	76.62	22.61	80.69	(79.73)	<1
Control	37	20.79	71.76	23.43	75.51	(76.45)	
Intelligibility							
Comm.-Centered	29	9.98	29.03	9.57	30.31	(29.66)	1.462
Control	37	8.82	30.14	8.76	30.14	(29.04)	
Over-all Comm. Eff.							
Comm.-Centered	29	44.80	146.93	42.44	153.69	(151.81)	<1
Control	37	36.31	140.00	42.43	146.16	(147.29)	

* For 5% level of significance F = 4.00

† Low scores indicate poor performance; high scores indicate good performance

TABLE 11

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL AND COMMUNICATION-CENTERED THERAPY GROUPS ON THE COMMUNICATIVE ATTRIBUTES RATING SCALE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
RATINGS							
Immediacy							
Conventional	24	2.72	15.42	2.67	17.04	(17.34)	2.205
Comm.-Centered	29	3.92	16.34	3.75	16.55	(16.83)	
Frequency							
Conventional	24	2.81	19.29	3.26	20.42	(20.09)	<1
Comm.-Centered	29	5.42	18.41	4.17	19.76	(19.54)	
Length							
Conventional	24	4.27	13.54	5.54	15.38	(15.70)	<1
Comm.-Centered	29	6.03	14.21	5.79	15.69	(15.42)	
Enthusiasm							
Conventional	24	3.99	11.88	4.22	13.04	(13.73)	<1
Comm.-Centered	29	5.23	13.62	5.06	13.83	(13.25)	
Involvement							
Conventional	24	4.19	13.92	3.95	15.08	(15.13)	<1
Comm.-Centered	29	5.95	14.03	5.34	14.86	(14.82)	
Understandability							
Conventional	24	5.19	16.12	5.23	17.04	(17.31)	<1
Comm.-Centered	29	6.12	16.72	5.76	17.59	(17.32)	
Articulation							
Conventional	24	3.06	11.50	3.14	12.00	(12.36)	<1
Comm.-Centered	29	4.11	12.31	4.12	12.72	(12.35)	
Appropriateness							
Conventional	24	4.37	17.21	3.97	17.54	(17.09)	<1
Comm.-Centered	29	4.96	16.00	5.42	16.24	(16.77)	
Ease							
Conventional	24	3.59	14.29	3.98	15.58	(16.01)	<1
Comm.-Centered	29	4.41	15.48	3.97	15.86	(15.46)	
Complexity							
Conventional	24	4.26	9.21	4.45	10.21	(10.47)	<1
Comm.-Centered	29	5.31	9.79	4.98	10.59	(10.34)	
Over-all							
Conventional	24	4.45	10.46	5.28	11.92	(155.51)	<1
Comm.-Centered	29	6.06	11.14	6.31	12.14	(151.81)	
MATH. COMPOSITES							
Comm. Initiative							
Conventional	24	15.89	74.04	16.54	80.96	(82.05)	<1
Comm.-Centered	29	25.05	76.62	22.61	80.69	(79.73)	
Intelligibility							
Conventional	24	7.99	27.62	8.05	29.04	(29.68)	<1
Comm.-Centered	29	9.98	29.03	9.57	30.31	(29.66)	
Over-all Comm. Eff.							
Conventional	24	30.38	142.38	32.58	153.33	(155.51)	<1
Comm.-Centered	29	44.80	146.93	42.44	153.69	(151.81)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

TABLE 12

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY EDUCABLE MENTALLY RETARDED AND SEVERELY MENTALLY RETARDED EXPERIMENTAL SUBJECTS ON THE COMMUNICATIVE ATTRIBUTES RATING SCALE

(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
RATINGS							
Immediacy							
Educable	27	2.83	17.07	2.73	17.85	(17.23)	1.337
Severe	26	3.65	14.73	3.49	15.65	(16.33)	
Frequency							
Educable	27	3.03	20.70	3.24	21.18	(19.88)	<1
Severe	26	4.83	16.85	3.98	18.88	(19.80)	
Length							
Educable	27	4.45	16.52	4.26	17.89	(15.65)	<1
Severe	26	4.75	11.19	5.10	13.12	(15.36)	
Enthusiasm							
Educable	27	3.96	14.96	3.90	15.18	(13.56)	<1
Severe	26	4.56	10.62	4.83	11.69	(13.02)	
Involvement							
Educable	27	4.36	16.81	3.89	17.07	(14.90)	<1
Severe	26	4.35	11.04	4.59	12.77	(14.97)	
Understandability							
Educable	27	5.37	18.41	5.23	19.07	(17.26)	<1
Severe	26	5.36	14.42	5.26	15.54	(17.30)	
Articulation							
Educable	27	4.04	12.89	4.05	13.26	(12.38)	<1
Severe	26	2.99	10.96	3.10	11.50	(12.34)	
Appropriateness							
Educable	27	3.84	18.56	4.09	19.22	(17.56)	4.429*
Severe	26	4.68	14.46	4.31	14.35	(15.78)	
Ease							
Educable	27	3.94	16.33	3.65	16.85	(15.72)	<1
Severe	26	3.75	13.50	3.97	14.58	(15.30)	
Complexity							
Educable	27	4.58	12.44	4.08	13.11	(10.79)	<1
Severe	26	2.93	6.50	3.66	7.62	(10.65)	
Over-all							
Educable	27	5.34	13.78	5.38	14.96	(12.25)	<1
Severe	26	3.39	7.77		9.00	(12.67)	
MATH. COMPOSITES							
Comm. Initiative							
Educable	27	17.12	86.07	16.44	89.19	(80.44)	<1
Severe	26	19.83	64.42	19.85	72.12	(79.70)	
Intelligibility							
Educable	27	9.17	31.30	8.90	32.33	(29.61)	<1
Severe	26	8.12	25.39	8.14	27.04	(29.73)	
Over-all Comm. Eff.							
Educable	27	33.43	164.70	32.97	170.70	(152.74)	<1
Severe	26	33.28	124.27	35.15	135.69	(152.49)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

(Appendix F)

SAN FRANCISCO INVENTORY OF COMMUNICATIVE EFFECTIVENESS

VERBAL OUTPUT SCALE

TABLE OF F RATIOS

TABLE 13

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL THERAPY AND CONTROL GROUPS ON THE VERBAL OUTPUT SCALE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
Words per Response							
Conventional	24	5.24	8.32	6.66	11.34	(11.06)	<1
Control	37	5.12	7.71	6.45	9.80	(10.02)	
Sentence Complexity							
Conventional	24	.47	2.48	.33	2.75	(2.75)	1.619
Control	37	.57	2.48	.60	2.59	(2.59)	
Grammatical Complexity							
Conventional	24	1.17	1.65	1.04	2.33	(2.35)	5.630*
Control	37	.93	1.70	1.21	1.84	(1.82)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance.

TABLE 14

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY COMMUNICATION-CENTERED THERAPY AND CONTROL GROUPS ON THE VERBAL OUTPUT SCALE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
Words per Response							
Comm.-Centered	29	8.35	10.12	7.63	12.06	(11.26)	<1
Control	37	5.12	7.71	6.45	9.80	(10.67)	
Sentence Complexity							
Comm.-Centered	29	.71	2.41	.54	2.68	(2.70)	<1
Control	37	.57	2.48	.60	2.59	(2.57)	
Grammatical Complexity							
Comm.-Centered	29	1.23	1.89	1.40	2.35	(2.26)	3.111
Control	37	.93	1.70	1.21	1.84	(1.94)	

* For 5% level of significance F = 4.00

† Low scores indicate poor performance; high scores indicate good performance.

TABLE 15

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL AND COMMUNICATION-CENTERED THERAPY GROUPS ON THE VERBAL OUTPUT SCALE

(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
Words per Response							
Conventional	24	5.24	8.32	6.66	11.34	(12.19)	<1
Comm.-Centered	29	8.35	10.12	7.63	12.06	(11.46)	
Sentence Complexity							
Conventional	24	.47	2.48	.33	2.75	(2.73)	<1
Comm.-Centered	29	.71	2.41	.54	2.68	(2.70)	
Grammatical Complexity							
Conventional	24	1.17	1.65	1.04	2.33	(2.39)	<1
Comm.-Centered	29	1.23	1.89	1.40	2.35	(2.23)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

TABLE 16

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY EDUCABLE MENTALLY RETARDED AND SEVERELY MENTALLY RETARDED EXPERIMENTAL SUBJECTS ON THE VERBAL OUTPUT SCALE

(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
Words per Response							
Educable	27	7.84	12.37	7.72	14.94	(12.97)	2.578
Severe	26	4.58	6.13	4.73	8.40	(10.70)	
Sentence Complexity							
Educable	27	.32	2.71	.42	2.83	(2.52)	<1
Severe	26	.71	2.17	.46	2.59	(2.69)	
Grammatical Complexity							
Educable	27	1.07	2.33	1.19	2.82	(2.31)	<1
Severe	26	1.08	1.21	1.11	1.83	(2.16)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

(Appendix F)

ARTICULATION PROFILE

TABLES OF F RATIOS

In the following tables reporting Articulation Profile data, low mean scores indicate good performance; high mean scores indicate poor performance.

TABLE 17

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL THERAPY AND CONTROL GROUPS ON THE ARTICULATION PROFILE

(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
INITIAL POS. - Picture							
Conventional	24	11.56	47.42	12.54	46.62	(44.38)	<1
Control	37	11.02	43.14	12.28	43.57	(45.65)	
INITIAL POS. - Word							
Conventional	24	11.89	44.00	10.91	43.08	(41.22)	<1
Control	37	10.94	39.54	12.05	40.24	(42.49)	
MEDIAL POS. - Picture							
Conventional	24	18.99	67.58	13.95	65.25	(61.73)	1.318
Control	37	19.34	56.62	18.50	59.97	(64.39)	
MEDIAL POS. - Word							
Conventional	24	18.49	57.88	13.94	56.83	(54.60)	<1
Control	37	18.36	50.22	19.99	51.73	(55.58)	
FINAL POS. - Picture							
Conventional	24	23.92	60.42	17.70	61.50	(57.39)	1.133
Control	37	19.73	47.46	21.01	48.19	(54.66)	
FINAL POS. - Word							
Conventional	24	25.56	53.33	15.50	53.42	(50.77)	1.092
Control	37	17.99	42.49	20.14	42.65	(48.32)	
IMITATED SOUND							
Conventional	24	11.15	36.58	10.02	37.92	(36.58)	2.660
Control	37	7.81	33.24	8.25	33.28	(34.83)	
TOTAL PICTURE							
Conventional	24	50.12	175.42	40.30	173.38	(162.94)	<1
Control	37	47.90	147.22	49.55	151.73	(165.45)	
TOTAL WORD							
Conventional	24	50.57	155.21	36.71	153.33	(146.01)	<1
Control	37	45.45	132.24	49.53	134.62	(146.75)	

* For 5% level of significance F = 4.02

† Low scores indicate good performance; high scores indicate poor performance.

TABLE 18

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY
COMMUNICATION-CENTERED THERAPY AND CONTROL GROUPS ON THE
ARTICULATION PROFILE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
INITIAL POS. - Picture							
Comm.-Centered	29	17.19	49.28	18.43	46.00	(43.00)	4.100*
Control	37	11.02	43.14	12.28	43.57	(46.55)	
INITIAL POS. - Word							
Comm.-Centered	29	18.25	46.72	17.20	40.93	(37.81)	15.201**
Control	37	10.94	39.54	12.05	40.24	(43.87)	
MEDIAL POS. - Picture							
Comm.-Centered	29	27.45	65.24	26.69	60.59	(56.70)	7.006*
Control	37	19.34	56.62	18.50	59.97	(63.44)	
MEDIAL POS. - Word							
Comm.-Centered	29	28.71	59.72	25.40	54.72	(50.79)	6.132*
Control	37	18.36	50.22	19.99	51.73	(56.50)	
FINAL POS. - Picture							
Comm.-Centered	29	29.03	60.76	28.08	54.17	(48.13)	8.604**
Control	37	19.73	47.46	21.01	48.19	(54.83)	
FINAL POS. - Word							
Comm.-Centered	29	29.89	55.03	27.15	49.38	(43.88)	6.530*
Control	37	17.99	42.49	20.14	42.65	(49.21)	
IMITATED SOUNDS							
Comm.-Centered	29	14.83	38.90	12.02	34.28	(32.31)	5.520*
Control	37	7.81	33.24	8.25	33.28	(35.79)	
TOTAL PICTURE							
Comm.-Centered	29	69.56	175.28	69.38	160.76	(147.31)	15.104**
Control	37	47.90	147.22	49.55	151.73	(165.39)	
TOTAL WORD							
Comm.-Centered	29	73.17	161.48	66.24	145.03	(132.17)	19.533**
Control	37	45.45	132.24	49.53	134.62	(150.06)	

* For 5% level of significance F = 4.00

** For 1% level of significance F = 7.08

† Low scores indicate good performance; high scores indicate poor performance

TABLE 19

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY CONVENTIONAL AND COMMUNICATION-CENTERED THERAPY GROUPS ON THE ARTICULATION PROFILE
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means †	Post S.D.	Post Means †	Adjusted Post Means †	F ratio*
INITIAL POS. - Picture							
Conventional	24	11.56	47.42	12.54	46.62	(47.59)	2.102
Comm.-Centered	29	17.19	49.28	18.43	46.00	(45.09)	
INITIAL POS. - Word							
Conventional	24	11.89	44.00	10.91	43.08	(44.21)	7.388**
Comm.-Centered	29	18.25	46.72	17.20	40.93	(39.75)	
MEDIAL POS. - Picture							
Conventional	24	18.99	67.58	13.96	65.25	(64.50)	1.114
Comm.-Centered	29	27.45	65.24	26.69	60.59	(61.65)	
MEDIAL POS. - Word							
Conventional	24	18.49	57.88	13.94	56.83	(57.36)	1.752
Comm.-Centered	29	28.71	59.72	25.40	54.72	(53.96)	
FINAL POS. - Picture							
Conventional	24	23.92	60.42	17.70	61.50	(61.61)	7.100*
Comm.-Centered	29	29.03	60.76	28.08	54.17	(54.02)	
FINAL POS. - Word							
Conventional	24	25.56	53.33	15.50	53.42	(53.84)	3.728
Comm.-Centered	29	29.89	55.03	27.15	49.38	(48.63)	
IMITATED SOUNDS							
Conventional	24	11.15	36.58	10.02	37.92	(38.85)	11.451**
Comm.-Centered	29	14.83	38.90	12.02	34.28	(33.47)	
TOTAL PICTURE							
Conventional	24	50.12	175.42	40.30	173.38	(173.33)	5.508*
Comm.-Centered	29	69.56	175.28	69.38	160.76	(160.83)	
TOTAL WORD							
Conventional	24	50.57	155.21	36.71	153.33	(155.32)	6.825*
Comm.-Centered	29	73.17	161.48	66.24	145.03	(142.27)	

* For 5% level of significance F = 4.02

** For 1% level of significance F = 7.12

† Low scores indicate good performance; high scores indicate poor performance

TABLE 20

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY EDUCABLE MENTALLY RETARDED AND SEVERELY MENTALLY RETARDED EXPERIMENTAL SUBJECTS ON THE ARTICULATION PROFILE

(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
INITIAL POS. - Picture							
Educable	27	14.84	44.81	16.23	42.79	(46.60)	<1
Severe	26	14.08	52.19	14.98	49.92	(46.45)	
INITIAL POS. - Word							
Educable	27	16.43	41.93	15.54	39.18	(42.42)	<1
Severe	26	14.09	49.19	13.26	44.73	(41.82)	
MEDIAL POS. - Picture							
Educable	27	28.20	63.56	23.89	57.33	(59.56)	6.696*
Severe	26	18.28	69.15	18.23	68.27	(65.87)	
MEDIAL POS. - Word							
Educable	27	28.23	55.56	22.90	50.78	(53.36)	3.487
Severe	26	19.63	62.35	17.49	60.77	(58.30)	
FINAL POS. - Picture							
Educable	27	29.85	55.37	24.83	50.96	(55.04)	2.601
Severe	26	22.01	66.04	21.57	64.27	(59.79)	
FINAL POS. - Word							
Educable	27	29.79	49.48	22.09	44.93	(48.20)	4.583*
Severe	26	25.12	59.25	21.48	57.73	(53.99)	
IMITATED SOUNDS							
Educable	27	12.81	34.78	12.88	34.44	(37.41)	<1
Severe	26	13.12	41.04	9.14	37.46	(35.88)	
TOTAL PICTURE							
Educable	27	70.15	163.74	62.85	151.07	(161.19)	3.749
Severe	26	48.17	187.38	48.42	182.46	(171.58)	
TOTAL WORD							
Educable	27	70.84	146.96	58.49	134.89	144.25	3.116
Severe	26	53.40	170.77	47.03	162.23	152.75	

* For 5% level of significance F = 4.02

† Low scores indicate good performance; high scores indicate poor performance

(Appendix F)

SOUND DISCRIMINATION TEST

TABLE OF F RATIOS

TABLE 21

EVALUATION OF PERFORMANCE CHANGE REGISTERED BY THE VARIOUS GROUPS ON THE SOUND DISCRIMINATION TEST
(Analysis of Covariance)

Sub-scale, Group	N	Pre S.D.	Pre Means†	Post S.D.	Post Means†	Adjusted Post Means†	F ratio*
Short Form							
Conventional	24	13.34	81.12	11.08	85.38	(85.28)	<1
Control	37	13.21	80.76	12.88	83.81	(83.90)	
Comm.-Centered	29	14.05	84.31	16.96	86.31	(84.95)	<1
Control	37	13.21	80.76	12.88	83.81	(84.70)	
Conventional	24	13.34	81.12	11.08	85.38	(86.25)	<1
Comm.-Centered	29	14.05	84.31	16.96	86.31	(85.09)	
Educable	27	11.10	88.81	9.31	92.52	(88.89)	3.838
Severe	26	13.68	76.69	15.86	79.00	(82.23)	

* For 5% level of significance F = 4.02

† Low scores indicate poor performance; high scores indicate good performance

(Appendix F)

INTER-TEST CORRELATION MATRIX

		CARS COMM INIT (1)	CARS Imm (2)	CARS Freq (3)	CARS Len (4)	CARS Enth (5)	CARS Inv (6)	CARS INT (7)	CARS Und (8)	CARS Art (9)	CARS App (10)	CARS Eas (11)	CARS Com (12)	CARS OVER SUB TOTAL (13)	CARS Over (14)	ART IP (15)	ART IW (16)	ART MP (17)	ART MW (18)	ART FP (19)	ART FW (20)	ART InS (21)	ART TP (22)	ART TW (23)	SD SPa (24)	SD SPb (25)	M.A. (26)	C.A. (27)	VOS WR (28)	VOS SC (29)	VOS OC (30)	VOS PS (31)	TRS Int (32)	TRS App (33)	TRS Res (34)	I.Q. (35)
CARS COMM INIT (1)	E_1	1.00	.79	.89	.86	.80	.96	.79	.38	.21	.83	.90	.85	.94	.89	-.40	-.03	-.05	-.01	-.05	-.01	-.01	-.02	-.03	.40	.46	.27	.10	.71	.50	.60	.12	.27	-.01	.30	.38
	E_2	1.00	.90	.96	.90	.93	.95	.60	.63	.57	.82	.89	.92	.97	.88	-.56	-.59	-.50	-.55	-.58	-.58	-.53	-.59	-.60	.47	.61	.33	-.26	.68	.75	.75	.68	.17	-.17	-.01	.55
	C	1.00	.91	.92	.94	.91	.95	.41	.49	.35	.70	.87	.96	.97	.85	-.13	-.09	-.21	-.20	-.35	-.31	-.23	-.26	-.23	.10	.18	.41	.16	.61	.51	.56	.23	.05	-.06	.37	.36
	Ed	1.00	.90	.88	.90	.92	.96	.47	.31	.39	.79	.91	.86	.96	.87	-.39	-.42	-.38	-.38	-.35	-.26	-.32	-.38	-.35	.32	.37	.02	-.05	.60	.66	.65	.23	.26	.13	.42	.09
	Sev	1.00	.87	.95	.96	.89	.90	.40	.39	.45	.80	.86	.88	.97	.83	-.31	-.36	-.42	-.50	-.48	-.50	-.33	-.44	-.51	.33	.47	.09	-.12	.68	.59	.54	.58	.32	-.07	-.06	.37
CARS Imm (2)	E_1		1.00	.84	.51	.58	.70	.03	.04	.08	.57	.63	.58	.83	.58	.03	.04	.05	-.01	.03	.05	.11	.09	.08	.12	.10	-.07	-.28	.44	.19	.32	-.01	.17	-.06	.27	.16
	E_2		1.00	.89	.62	.87	.81	.34	.34	.51	.73	.85	.65	.88	.76	-.42	-.46	-.46	-.49	-.49	-.51	-.38	-.49	-.52	.41	.59	.27	-.18	.53	.58	.61	.55	.07	-.19	-.03	.42
	C		1.00	.91	.76	.81	.77	.26	.10	.14	.53	.80	.63	.81	.68	-.03	-.08	-.13	-.12	-.25	-.08	-.14	-.16	-.14	-.08	.05	.26	.12	.46	.47	.40	.18	-.01	-.12	.32	.23
	Ed		1.00	.79	.80	.77	.79	.48	.50	.43	.70	.80	.60	.86	.72	-.33	-.37	-.39	-.38	-.31	-.28	-.28	-.36	-.34	.30	.42	.03	-.03	.45	.57	.55	.22	.07	-.05	.27	.08
	Sev		1.00	.85	.61	.76	.76	.37	.34	.30	.50	.70	.44	.73	.60	-.08	-.05	-.08	-.30	-.25	-.38	-.05	-.21	-.27	.14	.26	-.09	-.22	.49	.31	.33	.34	.18	-.12	-.04	.25
CARS Freq (3)	E_1			1.00	.67	.60	.82	.53	.46	.19	.67	.72	.67	.80	.70	.08	-.08	-.10	-.13	-.06	-.04	-.08	-.06	-.07	.30	.33	.19	-.13	.65	.41	.51	.17	.24	-.04	.22	.30
	E_2			1.00	.84	.91	.89	.51	.33	.48	.73	.68	.72	.90	.76	-.47	-.51	-.43	-.47	-.46	-.50	-.44	-.49	-.52	.38	.54	.31	-.22	.58	.72	.62	.69	.07	-.28	-.11	.50
	C			1.00	.79	.75	.84	.30	.36	.39	.59	.79	.66	.84	.69	-.09	-.20	-.10	-.20	-.30	-.28	-.22	-.23	-.21	.03	.12	.31	.20	.54	.42	.40	.12	.27	-.07	.36	.17
	Ed			1.00	.73	.76	.78	.39	.41	.33	.62	.71	.66	.80	.66	-.36	-.40	-.35	-.36	-.30	-.28	-.35	-.34	-.34	.18	.25	.04	.06	.46	.54	.45	.29	.18	-.08	.21	-.00
	Sev			1.00	.73	.85	.90	.31	.48	.39	.67	.76	.61	.88	.76	-.25	-.30	-.37	-.46	-.39	-.45	-.26	-.39	-.46	.25	.35	.07	-.11	.62	.58	.45	.57	.24	-.05	-.04	.32
CARS Len (4)	E_1				1.00	.60	.82	.33	.60	.52	.77	.84	.88	.95	.90	-.20	-.27	-.27	-.30	-.29	-.26	-.35	-.31	-.30	.59	.65	.50	.15	.85	.71	.80	.87	.35	-.10	.29	.42
	E_2				1.00	.82	.86	.76	.76	.12	.77	.83	.90	.95	.90	-.60	-.70	-.64	-.66	-.67	-.68	-.63	-.70	-.71	.61	.71	.37	-.27	.79	.79	.86	.64	.32	-.11	-.01	.58
	C				1.00	.83	.92	.50	.57	.35	.78	.78	.92	.96	.89	-.28	-.36	-.27	-.27	-.42	-.40	-.32	-.33	-.30	.25	.33	.54	.24	.63	.49	.69	.29	.10	.01	.41	.42
	Ed				1.00	.76	.87	.45	.67	.38	.76	.80	.92	.97	.93	-.54	-.54	-.54	-.54	-.55	-.45	-.48	-.57	-.53	.49	.51	.18	-.02	.73	.77	.81	.18	.47	.18	.46	.27
	Sev				1.00	.67	.71	.40	.63	.73	.63	.72	.88	.93	.83	-.53	-.54	-.62	-.65	-.51	-.60	-.44	-.60	-.67	.53	.67	.22	.02	.86	.72	.75	.54	.39	-.10	-.11	.28
CARS Enth (5)	E_1					1.00	.85	.09	.16	-.03	.74	.83	.73	.79	.67	.04	-.08	.26	.17	.28	.23	-.05	.02	.18	.30	.40	.16	-.19	.48	.40	.35	.16	.10	.01	.23	.33
	E_2					1.00	.89	.35	.56	.49	.67	.89	.70	.90	.79	-.44	-.50	-.42	-.47	-.50	-.51	-.43	-.49	-.52	.37	.50	.17	-.30	.59	.66	.66	.69	.19	-.09	.03	.45
	C					1.00	.81	.39	.49	.21	.37	.80	.74	.87	.78	-.16	-.09	-.21	-.18	-.29	-.26	-.21	-.24	-.20	-.06	.01	.08	.01	.55	.47	.52	.27	.06	-.08	.29	.30
	Ed					1.00	.89	.33	.29	.15	.86	.82	.73	.88	.71	-.20	-.26	-.15	-.17	-.10	-.01	-.12	-.15	-.12	.15	.21	-.18	-.18	.44	.53	.47	.24	.12	.14	.46	-.04
	Sev					1.00	.78	.37	.35	.39	.50	.88	.50	.83	.67	-.30	-.30	-.27	-.35	-.31	-.37	-.29	-.30	-.38	.25	.44	-.03	-.18	.54	.44	.39	.56	.26	-.04	-.13	.42
CARS Inv (6)	E_1						1.00	.26	.27	.16	.83	.89	.83	.91	.84	-.01	.08	.08	-.03	-.03	.09	-.01	.02	.04	.35	.41	.30	-.09	.66	.41	.58	.09	.32	.11	.28	.39
	E_2						1.00	.36	.58	.45	.86	.80	.86	.93	.81	-.56	-.50	-.47	-.50	-.55	-.53	-.53	-.55	-.56	.45	.54	.39	-.26	.66	.72	.72	.63	.10	-.13	.08	.59
	C						1.00	.42	.31	.26	.78	.79	.89	.93	.80	-.08	-.03	-.17	-.16	-.31	-.27	-.26	-.21	-.18	.23	.32	.52	.16	.60	.50	.54	.20	.03	-.03	.32	.49
	Ed						1.00	.38	.42	.32	.85	.87	.85	.91	.87	-.31	-.38	-.31	-.29	-.26	-.15	-.24	-.30	-.26	.28	.29	.02	-.05	.60	.59	.63	.16	.27	.27	.49	.08
	Sev						1.00	.31	.31	.39	.75	.74	.63	.87	.85	-.33	-.39	-.36	-.46	-.38	-.43	-.39	-.41	-.47	.27	.36	.17	-.08	.51	.54	.46	.55	.30	-.01	.03	.36
CARS INT (7)	E_1							1.00	.96	.95	.30	.34	.50	.57	.58	-.66	-.63	-.61	-.57	-.65	-.66	-.51	-.69	-.69	.66	.62	.68	.37	.60	.79	.82	.23	.64	-.18	-.14	.44
	E_2							1.00	.98	.96	.61	.52	.70	.77	.74	-.85	-.86	-.87	-.87	-.85	-.86	-.88	-.92	-.90	.75	.77	.52	-.01	.67	.63	.80	.35	.59	-.07	-.23	.52
	C							1.00	.97	.94	.33	.45	.56	.45	.46	-.76	-.70	-.73	-.73	-.78	-.70	-.69	-.79	-.74	.29	.28	.34	.06	.50	.21	.57	.29	.49	.12	.21	.38
	Ed							1.00	.98	.97	.37	.38	.57	.60	.60	-.80	-.86	-.88	-.90	-.92	-.88	-.87	-.93	-.93	.60	.56	.58	.42	.61	.74	.75	.11	.67	-.08	-.08	.38
	Sev							1.00	.98	.95	.44	.42	.63	.66	.60	-.60	-.62	-.67	-.58	-.53	-.64	-.68	-.70	-.68	.76	.80	.40	.08	.61	.65	.82	.37	.64	.11	-.27	.46
CARS Und (8)	E_1								1.00	.87	.36	.37	.56	.60	.62	-.60	-.57	-.49	-.45	-.57	-.60	-.46	-.60	-.60	.72	.67	.70	.33	.57	.84	.84	.25	.63	-.19	-.09	.48
	E_2								1.00	.90	.63	.53	.71	.78	.75	-.88	-.86	-.86	-.86	-.86	-.88	-.84	-.92	-.91	.74	.76	.49	-.04	.63	.62	.81	.34	.53	-.12	-.21	.51
	C								1.00	.81	.54	.52	.60	.71	.70	-.67	-.60	-.65	-.67	-.74	-.65	-.64	-.72	-.67	.30	.29	.33	-.00	.52	.28	.60	.29	.46	.11	.25	.44
	Ed								1.00	.90	.40	.41	.61	.72	.72	-.85	-.85	-.85	-.87	-.90	-.86	-.85	-.90	-.91	.60	.55	.54	.42	.57	.78	.77	.10	.64	-.12	-.05	.33
	Sev								1.00	.88	.46	.39	.63	.68	.60	-.67	-.64	-.63	-.54	-.56	-.66	-.50	-.69	-.67	.77	.79	.42	.07	.54	.62	.81	.36	.63	.08	-.21	.49
CARS Art (9)	E_1									1.00	.19	.28	.36	.47	.46	-.70	-.67	-.73	-.72	-.72	-.71	-.56	-.72	-.78	.52	.49	.60	.39	.62	.65	.73	.18	.59	-.15	-.20	.33
	E_2									1.00	.53	.48	.64	.70	.67	-.85	-.86	-.86	-.83	-.77	-.78	-.75	-.86	-.85	.72	.74	.52	.04	.69	.61	.74	.33	.65	.01	-.24	.51
	C									1.00	.46	.31	.39	.51	.48	-.78	-.76	-.75	-.73	-.74	-.69	-.68	-.75	-.75	.26	.26	.38	.14	.42	.08	.47	.25	.49	.12	.13	.25
	Ed									1.00	.30	.31	.48	.60	.58	-.80	-.82	-.88	-.85	-.89	-.85	-.85	-.92	-.90	.37	.58	.59	.40	.62	.63	.68	.12	.67	-.03	-.12	.42
	Sev									1.00	.36	.44	.60	.58	.55	-.56	-.58	-.58	-.60	-.45	-.56	-.41	-.65	-.64	.69	.74	.35	.10	.69	.66	.78	.35	.61	.15	-.35	.38
CARS App (10)	E_1										1.00	.72	.76	.85	.83	-.09	-.08	-.03	-.08	-.07	-.04	-.12	-.06	-.05	.44	.49	.25	.13	.68	.54	.59	.09	.22	.05	.32	.19
	E_2										1.00	.61	.79	.88	.85	-.44	-.41	-.35	-.56	-.43	-.62	-.62	-.64	-.63	.37	.72	.55	-.08	.62	.60	.71	.34	.07	-.06	.11	.61
	C										1.00	.53	.78	.80	.80	-.25	-.30	-.29	-.31	-.44	-.44	-.25	-.37	-.35	.43	.46	.58	.32	.46	.16	.51	.31	.16	.09	.29	.39
	Ed										1.00	.72	.80	.82	.81	-.28	-.32	-.33	-.30	-.28	-.22	-.37	-.27	-.28	.53	.58	.19	.07	.55	.58	.60	-.04	.25	.35	.52	.18
	Sev										1.00	.42	.65	.76	.76	-.37	-.34	-.42	-.52	-.37	-.62	-.58	-.59	-.62	.39	.49	.33	.22	.54	.46	.50	.28	.20	-.03	.11	.13
CARS Eas (11)	E_1											1.00	.78	.89	.82	-.10	-.10	-.08	-.03	-.09	-.06	-.14	-.07	-.06	.46	.47	.21	-.15	.74	.47	.56	.00	.35	.46	.34	.33
	E_2											1.00	.70	.86	.76	-.39	-.44	-.37	-.42	-.49	-.48	-.38	-.45	-.47	.38	.47	.01	-.47	.61	.59	.65	.63	.34	-.03	.16	.38
	C											1.00	.49	.87	.76	-.13	-.25	-.28	-.25	-.31	-.25	-.28	-.25	-.22	-.01	.09	.25	.12	.55	.35	.46	.17	.13	-.06	.03	.19
	Ed											1.00	.82	.88	.78	-.25	-.28	-.28	-.33	-.30	-.30	-.16	-.27	-.28	.26	.26	-.10	-.21	.58	.57	.66	.10	.34	.22	.54	.07
	Sev											1.00	.52	.83	.83	-.17	-.36	-.37	-.38	-.30	-.38	-.16	-.29	-.36	.38	.48	-.14	-.37	.64	.46	.44	.54	.40	-.12	.04	.42
CARS Com (12)	E_1												1.00	.92	.88	-.12	-.32	-.03	-.08	-.07	-.08	-.06	-.07	-.05	.64	.66	.62	.75	.70	.73	.78	.22	.39	.03	.33	.62
	E_2												1.00	.94	.85	-.44	-.44	-.37	-.39	-.45	-.43	-.41	-.45	-.65	.55	.63	.48	-.15	.65	.71	.85	.52	.26	-.05	.16	.61
	C												1.00	.90	.80	-.21	-.11	-.26	-.23	-.38	-.33	-.26	-.31	-.25	.36	.37	.59	.21	.61	.45	.68	.26	.03	-.02	.33	.52
	Ed												1.00	.92	.85	-.39	-.40	-.42	-.42	-.44	-.35	-.36	-.44	-.41	.51	.53	.25	.03	.78	.71	.82	.19	.48	.30	.52	.31
	Sev												1.00	.90	.80	-.43	-.49	-.40	-.40	-.36	-.47	-.42	-.46	-.50	.54	.59	.43	.25	.68	.75	.74	.54	.40	.49	.17	.25
CARS OVER SUB TOTAL (13)	E_1													1.00	.94	-.23	-.21	-.18	-.20	-.21	-.18	-.22	-.22	-.22	.60	.62	.47	.55	.82	.71	.79	.16	.44	-.04	.25	.47
	E_2													1.00	.94	-.60	-.72	-.65	-.68	-.71	-.71	-.65	-.72	-.73	.60	.72	.42	-.22	.76	.77	.84	.62	.29	-.12	-.01	.60
	C													1.00	.93	-.30	-.27	-.30	-.30	-.50	-.47	-.30	-.45	-.40	.22	.27	.48	.28	.66	.45	.65	.29	.19	-.00	.37	.42
	Ed													1.00	.95	-.55	-.56	-.56	-.56	-.56	-.45	-.49	-.57	-.58	.49	.51	.22	.08	.72	.77	.80	.18	.44	.15	.39	.22
	Sev													1.00	.91	-.49	-.50	-.54	-.50	-.53	-.68	-.45	-.59	-.58	.53	.65	.22	-.04	.77	.69	.71	.58	.45	-.03	-.08	.42
CARS Over (14)	E_1														1.00	-.57	-.53	-.50	-.39	-.59	-.53	-.54	-.57	-.54	.61	.58	.52	.10	.77	.68	.79	.08	.47	-.04	.28	.48
	E_2														1.00	-.67	-.67	-.61	-.63	-.73	-.67	-.67	-.70	-.69	.57	.66	.45	-.15	.79	.73	.86	.53	.25	-.05	.12	.58
	C														1.00	-.28	-.30	-.34	-.33	-.46	-.38	-.31	-.39	-.33	.30	.32	.52	.15	.63	.45	.68	.31	.16	.06	.32	.50
	Ed														1.00	-.50	-.51	-.54	-.53	-.58	-.49	-.47	-.57	-.53	.53	.53	.28	.08	.74	.76	.85	.11	.46	.23	.44	.23
	Sev														1.00	-.33	-.33	-.47	-.50	-.51	-.59	-.54	-.56	-.60	.50	.57	.32	.14	.68	.73	.71	.54	.42	.01	.09	.26

TABLE 22

INTER-TEST
CORRELATION MATRIX

KEY TO SYMBOLS

E_1 — Experimental group 1
E_2 — Experimental group 2
C — Control group
Ed — Educable mentally retarded
Sev - Severely mentally retarded

CARS — Communicative Attributes Rating Scale

1. COMM INIT — Communicative Initiation
(Composite score = total of 2,3,4,5,6)
2. Imm — Immediacy of response
3. Freq — Frequency of response
4. Len — Length of response
5. Enth — Enthusiasm
6. Inv — Involvement
7. INT — Intelligibility
(Composite score = total of 8 and 9)
8. Und — Understandability
9. Art — Articulation
10. App — Appropriateness
11. Eas — Ease of relationship
12. Com — Complexity of ideation
13. OVER SUB TOTAL — Overall communicative effectiveness
(Composite score = total of 2,3,4,5,6,8,9,10,11,12)
14. Over — Overall communicative effectiveness
(Not a mathematical composite but an overall rating)

(See page 174 for Key to Symbols continued)

TABLE [illegible] (continued)

KEY TO SYMBOLS (continued)

E_1 — Experimental group 1
E_2 — Experimental group 2
C — Control group
Ed — Educable mentally retarded
Sev - Severely mentally retarded

ART — Articulation Profile

- 15. IP — Initial picture
- 16. IW — Initial word
- 17. MP — Medial picture
- 18. MW — Medial word
- 19. FP — Final picture
- 20. FW — Final word
- 21. ImS — Imitated sound
- 22. TP — Total picture
- 23. TW — Total word

SD — Sound Discrimination Test

- 24. SFa — Short form, part a. (12 items)
- 25. SFb — Short form, part b. (18 items)

26. M.A. — Mental age

27. C.A. — Chronological age

VOS — Verbal Output Scale

- 28. W/R — Words per response
- 29. SC — Sentence complexity
- 30. GC — Grammatical complexity
- 31. PS — Parts of speech

TRS — Teacher Rating Scale

- 32. Int — Intelligibility
- 33. App — Appropriateness
- 34. Rne — Ease of relationship

35. I.Q. — Intelligence quotient

		ART IP (15)	ART IW (16)	ART MP (17)	ART MW (18)	ART FP (19)	ART FW (20)	ART ImS (21)	ART TP (22)	ART TW (23)	SD SFa (24)	SD SFb (25)	M.A. (26)	C.A. (27)	VOS WR (28)	VOS SC (29)	VOS GC (30)	VOS PS (31)	TRS Int (32)	TRS App (33)	TRS Rne (34)	I.Q. (35)
ART IP (15)	E_1	1.00	.95	.87	.61	.72	.73	.84	.83	.81	-.36	-.40	-.42	-.44	-.37	-.36	-.28	.02	-.19	.21	.37	-.09
	E_2	1.00	.96	.85	.84	.80	.80	.89	.98	.90	-.67	-.64	-.54	-.08	-.57	-.56	-.72	-.29	-.51	.10	.20	-.50
	C	1.00	.90	.87	.84	.84	.72	.76	.93	.87	-.17	-.14	-.21	-.23	-.24	-.10	-.34	-.29	-.49	-.18	-.19	-.01
	Ed	1.00	.98	.89	.89	.87	.84	.23	.96	.96	-.46	-.36	-.48	-.38	-.51	-.59	-.58	-.12	-.59	.07	.13	-.30
	Sev	1.00	.94	.87	.61	.68	.66	.84	.83	.78	-.56	-.64	-.35	-.16	-.39	-.45	-.43	-.14	-.26	-.03	.30	-.27
ART IW (16)	E_1		1.00	.83	.80	.67	.69	.88	.79	.80	-.33	-.37	-.44	-.40	-.35	-.31	-.26	-.03	-.15	.23	.34	-.15
	E_2		1.00	.85	.86	.80	.81	.90	.98	.98	-.59	-.59	-.49	-.08	-.54	-.56	-.71	-.38	-.50	.13	.13	-.47
	C		1.00	.87	.98	.86	.86	.78	.81	.94	-.14	-.12	-.13	-.26	-.21	-.07	-.26	-.18	-.62	-.20	-.22	.13
	Ed		1.00	.84	.85	.83	.81	.90	.89	.91	-.45	-.33	-.47	-.39	-.44	-.68	-.56	-.18	-.55	.14	.09	-.28
	Sev		1.00	.71	.80	.65	.68	.88	.86	.86	-.46	-.37	-.35	-.11	-.41	-.43	-.40	-.26	-.25	-.09	.22	-.23
ART MP (17)	E_1			1.00	.96	.83	.81	.63	.97	.91	-.09	-.06	-.35	-.43	-.43	-.25	-.37	.14	-.34	-.02	.13	-.01
	E_2			1.00	.98	.86	.87	.86	.96	.95	-.71	-.71	-.58	-.10	-.51	-.57	-.67	-.38	-.58	.14	.26	-.42
	C			1.00	.91	.86	.84	.73	.97	.91	-.09	-.08	-.27	-.30	-.27	-.16	-.27	-.32	-.65	-.40	-.40	-.01
	Ed			1.00	.93	.89	.88	.92	.97	.92	-.59	-.54	-.56	-.51	-.49	-.58	-.56	-.03	-.54	.06	.16	-.28
	Sev			1.00	.95	.74	.75	.82	.90	.89	-.39	-.44	-.32	-.01	-.50	-.56	-.64	-.37	-.42	.03	.32	-.33
ART MW (18)	E_1				1.00	.72	.75	.64	.88	.90	-.08	-.00	-.29	-.35	-.44	-.22	-.37	.09	-.31	.10	.21	-.01
	E_2				1.00	.88	.88	.87	.96	.97	-.60	-.72	-.48	-.09	-.58	-.57	-.69	-.42	-.59	.14	.23	-.40
	C				1.00	.90	.89	.76	.93	.98	-.15	-.15	-.23	-.23	-.32	-.10	-.31	-.23	-.67	-.40	-.34	-.02
	Ed				1.00	.89	.88	.92	.97	.97	-.60	-.54	-.53	-.58	-.47	-.68	-.58	-.08	-.60	.08	.17	-.22
	Sev				1.00	.74	.75	.85	.87	.90	-.25	-.36	-.21	.03	-.50	-.51	-.59	-.41	-.35	.07	.25	-.27
ART FP (19)	E_1					1.00	.96	.73	.96	.93	-.30	-.25	-.25	-.30	-.49	-.35	-.41	.15	-.34	.22	.12	-.08
	E_2					1.00	.98	.75	.95	.95	-.56	-.63	-.50	-.09	-.56	-.49	-.74	-.32	-.54	.07	.06	-.44
	C					1.00	.96	.81	.96	.75	-.19	-.16	-.29	-.29	-.36	-.21	-.42	-.37	-.70	-.27	-.36	-.05
	Ed					1.00	.98	.92	.97	.96	-.52	-.41	-.50	-.50	-.58	-.61	-.66	.03	-.63	.05	.09	-.20
	Sev					1.00	.97	.71	.91	.90	-.33	-.51	-.14	-.08	-.46	-.37	-.50	-.23	-.26	.05	-.01	.30
ART FW (20)	E_1						1.00	.79	.93	.95	-.26	-.23	-.22	-.17	-.43	-.35	-.38	.08	-.35	.31	.14	-.06
	E_2						1.00	.88	.96	.96	-.58	-.67	-.51	-.09	-.53	-.52	-.75	-.33	-.50	.14	.15	-.43
	C						1.00	.81	.98	.96	-.27	-.14	-.33	-.33	-.38	-.18	-.40	-.41	-.69	-.29	-.39	-.15
	Ed						1.00	.92	.95	.96	-.49	-.39	-.51	-.53	-.44	-.54	-.59	.07	-.54	.15	.15	-.18
	Sev						1.00	.75	.90	.94	-.38	-.56	-.16	-.09	-.55	-.46	-.60	-.33	-.36	.10	.07	-.32
ART ImS (21)	E_1							1.00	.78	.84	-.18	-.21	-.36	-.20	-.36	-.28	-.17	-.06	-.14	.35	.26	.01
	E_2							1.00	.93	.92	-.54	-.58	-.61	-.13	-.50	-.53	-.68	-.33	-.44	-.17	.19	-.50
	C							1.00	.80	.82	-.20	-.18	-.21	-.14	-.28	-.20	-.32	-.31	-.53	-.27	-.28	-.12
	Ed							1.00	.96	.96	-.43	-.32	-.54	-.49	-.43	-.53	-.50	-.07	-.54	-.18	-.20	-.26
	Sev							1.00	.80	.83	-.28	-.41	-.21	-.08	-.36	-.35	-.35	-.28	-.18	.06	.14	-.09
ART TP (22)	E_1								1.00	.98	-.26	-.23	-.35	-.36	-.46	-.34	-.40	.13	-.34	.15	.19	-.06
	E_2								1.00	.99	-.68	-.70	-.55	-.08	-.58	-.57	-.73	-.35	-.58	.11	.18	-.48
	C								1.00	.96	-.16	-.13	-.28	-.29	-.31	-.17	-.36	-.35	-.66	-.32	-.35	-.03
	Ed								1.00	.99	-.56	-.47	-.54	-.49	-.53	-.61	-.63	-.03	-.61	.07	.13	-.26
	Sev								1.00	.98	-.46	-.59	-.30	-.01	-.51	-.51	-.60	-.29	-.35	.03	.20	-.31
ART TW (23)	E_1									1.00	-.23	-.20	-.30	-.31	-.46	-.33	-.38	.07	-.32	.25	.23	-.07
	E_2									1.00	-.65	-.70	-.52	-.08	-.56	-.58	-.76	-.39	-.56	.15	.19	-.45
	C									1.00	-.16	-.14	-.26	-.28	-.31	-.13	-.35	-.30	-.70	-.34	-.34	.00
	Ed									1.00	-.56	-.46	-.53	-.50	-.47	-.61	-.61	-.04	-.59	.13	.15	-.23
	Sev									1.00	-.39	-.54	-.26	.03	-.56	-.52	-.60	-.37	-.37	.05	.19	-.31
SD SFa (24)	E_1										1.00	.93	.60	.06	.48	.76	.71	.13	.19	-.08	.15	.47
	E_2										1.00	.98	.37	-.10	.50	.62	.68	.27	.50	.07	-.00	.39
	C										1.00	.94	.27	.34	.05	.97	.38	.23	-.05	-.17	.15	.30
	Ed										1.00	.98	.48	.33	.43	.68	.63	-.11	.55	.22	.32	.27
	Sev										1.00	.90	.30	.38	.60	.60	.64	.30	.32	.90	-.16	.26
SD SFb (25)	E_1											1.00	.61	.21	.68	.78	.69	.27	.19	-.15	.09	.51
	E_2											1.00	.42	-.05	.58	.65	.74	.32	.30	.02	-.12	.44
	C											1.00	.59	.35	.70	.16	.35	.85	-.04	-.10	.22	.33
	Ed											1.00	.33	.28	.45	.67	.60	.03	.43	.15	.27	.21
	Sev											1.00	.38	.14	.60	.58	.69	.36	.31	.04	-.21	.35
M.A. (26)	E_1												1.00	.42	.45	.64	.70	.50	.42	.02	-.08	.77
	E_2												1.00	.41	.37	.33	.36	.04	.11	-.23	-.22	.71
	C												1.00	.07	.27	.26	.41	.32	.06	-.02	.41	.47
	Ed												1.00	.64	.25	.22	.25	-.11	.44	-.15	-.22	.71
	Sev												1.00	.74	.12	.32	.46	.05	.19	.36	.06	.36
C.A. (27)	E_1													1.00	.15	.30	.29	.03	-.03	.31	.13	-.27
	E_2													1.00	-.19	-.15	-.14	-.33	.01	-.01	-.12	-.30
	C													1.00	.08	-.01	.12	.26	.17	-.06	.37	-.32
	Ed													1.00	-.01	.11	.09	-.07	.33	-.09	-.30	-.08
	Sev													1.00	.08	.17	.23	-.15	-.30	.18	.14	-.29
VOS W/R (28)	E_1														1.00	.62	.75	.83	.34	-.05	.24	.36
	E_2														1.00	.62	.77	.48	.43	.16	.10	.55
	C														1.00	.89	.65	.82	.23	.03	.26	.29
	Ed														1.00	.55	.78	.13	.54	.41	.35	.34
	Sev														1.00	.70	.71	.51	.89	-.10	-.05	.09

		VOS SC (29)	VOS GC (30)	VOS PS (31)	TRS Int (32)	TRS App (33)	TRS Rne (34)	I.Q. (35)
VOS SC (29)	E_1	1.00	.87	.87	.46	-.33	.33	.46
	E_2	1.00	.82	.80	.03	-.23	-.26	.43
	C	1.00	.50	.33	-.13	-.16	.11	-.33
	Ed	1.00	.85	.13	-.03	.06	-.33	.33
	Sev	1.00	.80	.78	.36	-.14	-.25	.30
VOS GC (30)	E_1		1.00	.83	.30	-.06	.16	.33
	E_2		1.00	.38	.16	-.03	-.08	.47
	C		1.00	.47	.40	.01	-.11	.29
	Ed		1.00	.15	.06	.23	-.37	.26
	Sev		1.00	.35	.51	-.06	-.16	.33
VOS PS (31)	E_1			1.00	.42	-.12	.07	.30
	E_2			1.00	.11	-.26	-.21	.39
	C			1.00	.26	.07	.20	.14
	Ed			1.00	.21	.26	-.11	-.07
	Sev			1.00	.39	-.24	-.26	.36
TRS Int (32)	E_1				1.00	.16	.40	.41
	E_2				1.00	.46	.06	.10
	C				1.00	.45	-.23	-.13
	Ed				1.00	.39	-.03	.28
	Sev				1.00	.23	-.07	.73
TRS App (33)	E_1					1.00	.30	-.26
	E_2					1.00	.40	-.27
	C					1.00	.34	.26
	Ed					1.00	.26	.30
	Sev					1.00	.40	.39
TRS Rne (34)	E_1						1.00	-.16
	E_2						1.00	-.08
	C						1.00	-.06
	Ed						1.00	.20
	Sev						1.00	-.06

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